



Keeping Cool in the Greenhouse

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American Hungarian Educators' Association Banquet
Berkeley, California
May 16, 2009





Our atmosphere is as thin -- in proportion to the Earth's diameter -- as a film of condensation on a steel ball.



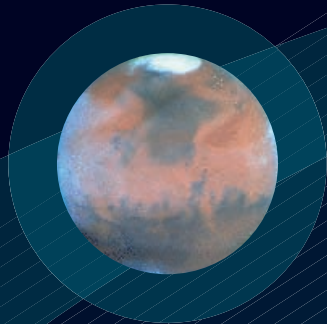


Planets and atmospheres

Mars

Thin atmosphere
(All CO₂ in ground)

Average temperature : - 50°C



Earth

0,03% of CO₂ in the atmosphere

Average temperature : + 14°C



Venus

Thick atmosphere
containing 96% of CO₂

Average temperature : + 420°C



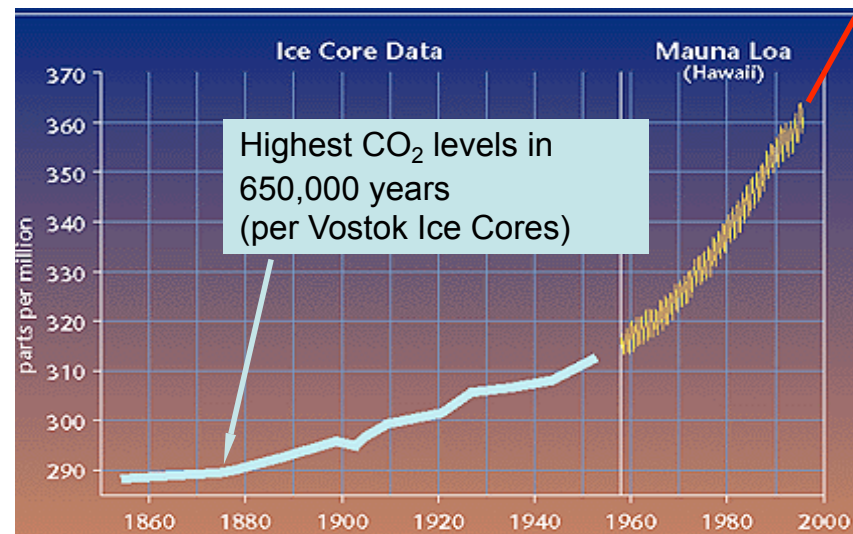
The most important human influence is fossil fuel combustion ...



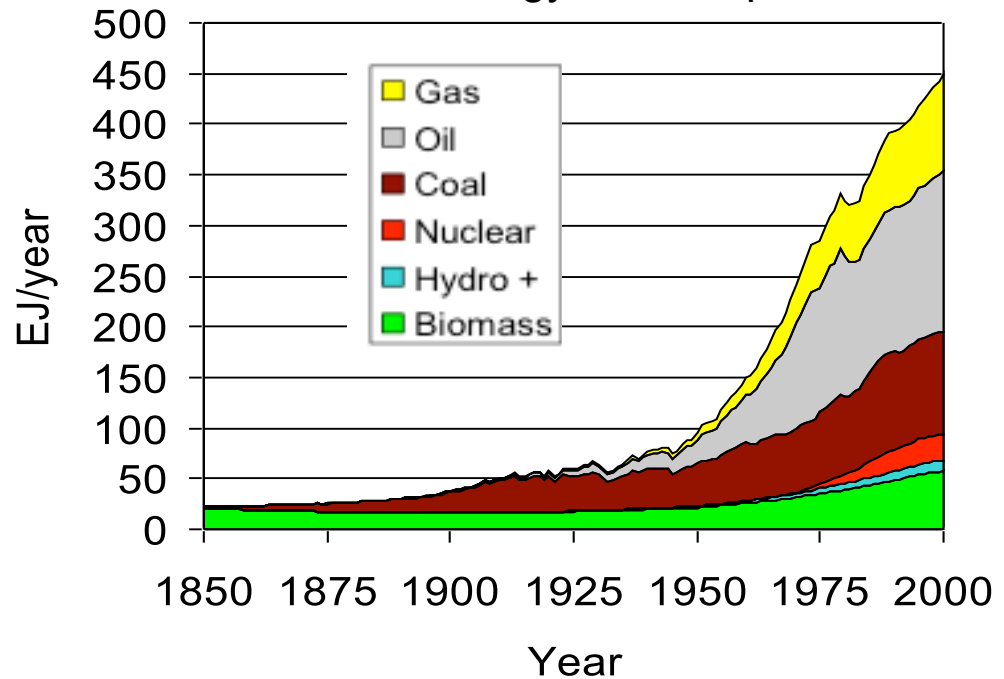
... but there are others



World Carbon Dioxide Concentrations



World Energy Consumption



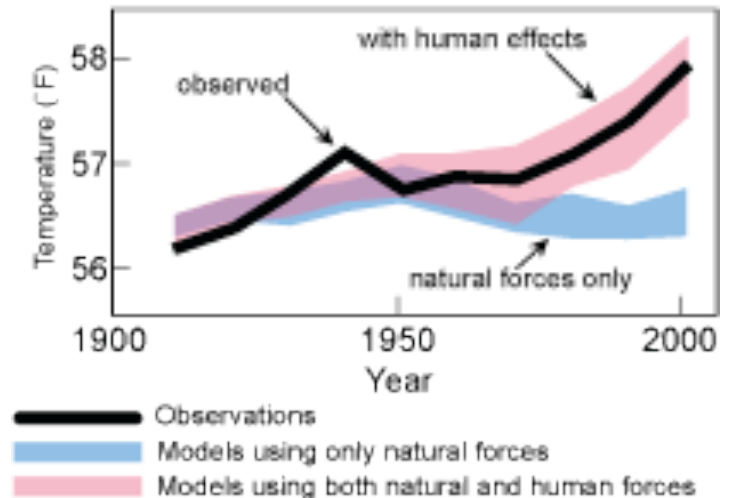
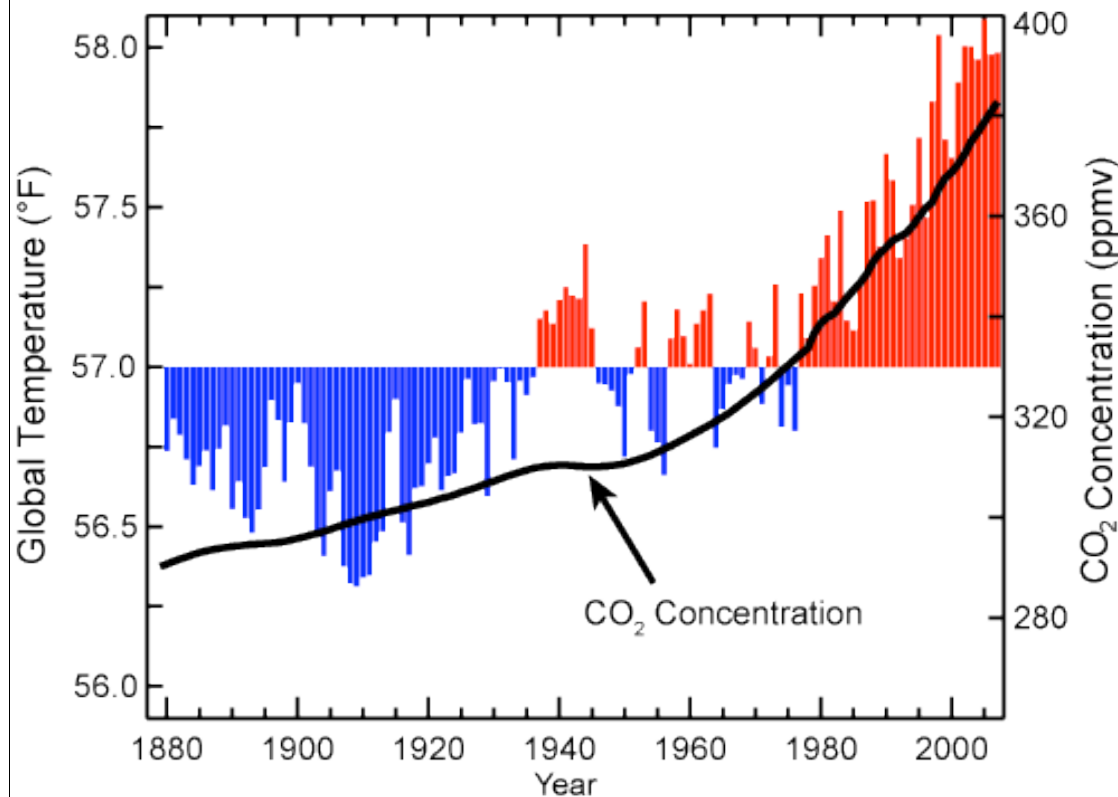
U.S. Climate Change Science Program Milestone Study to be Released in June



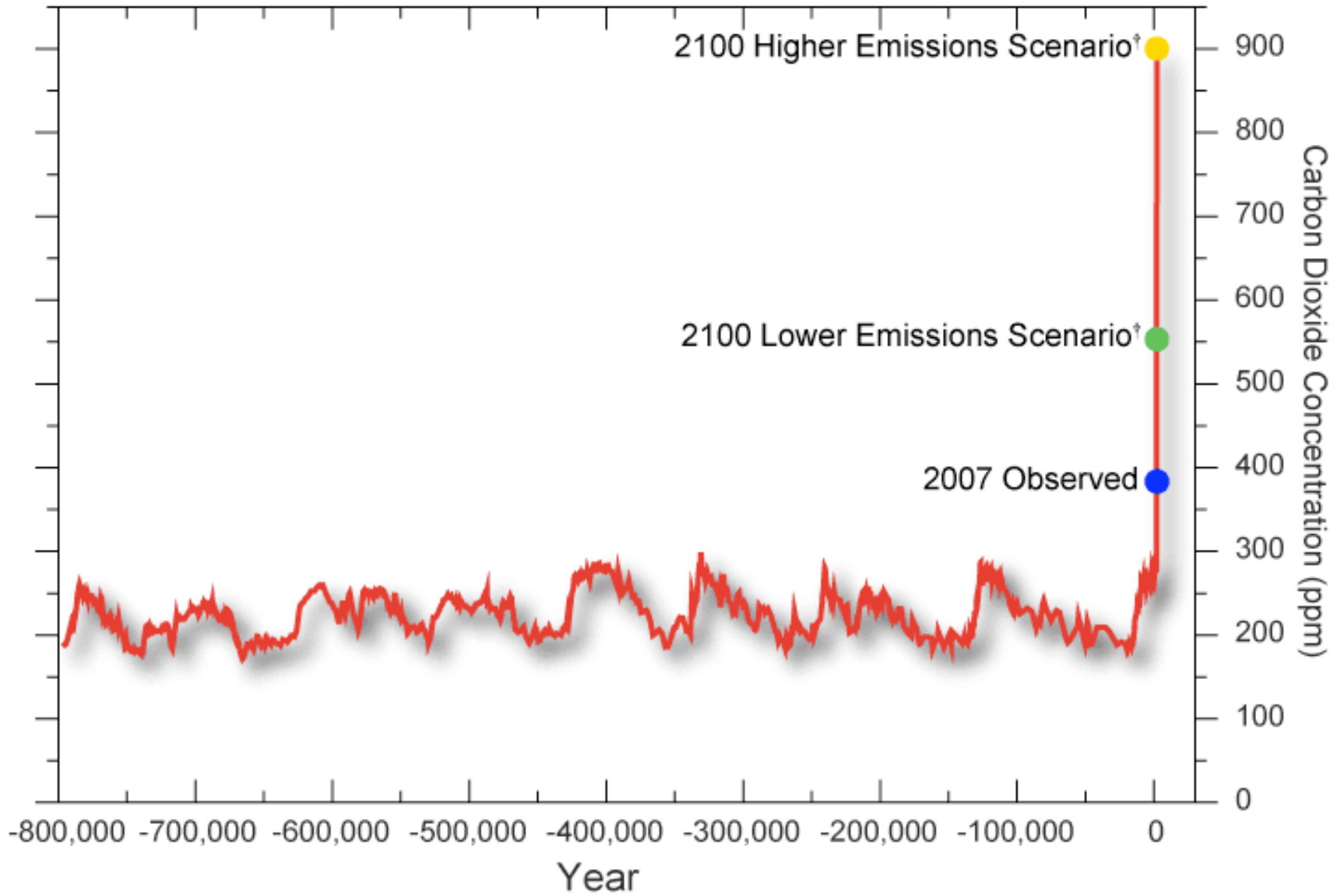
All CCSP results shown are in final draft

I. Global warming is unequivocal and primarily human-induced

Global Temperature and CO₂

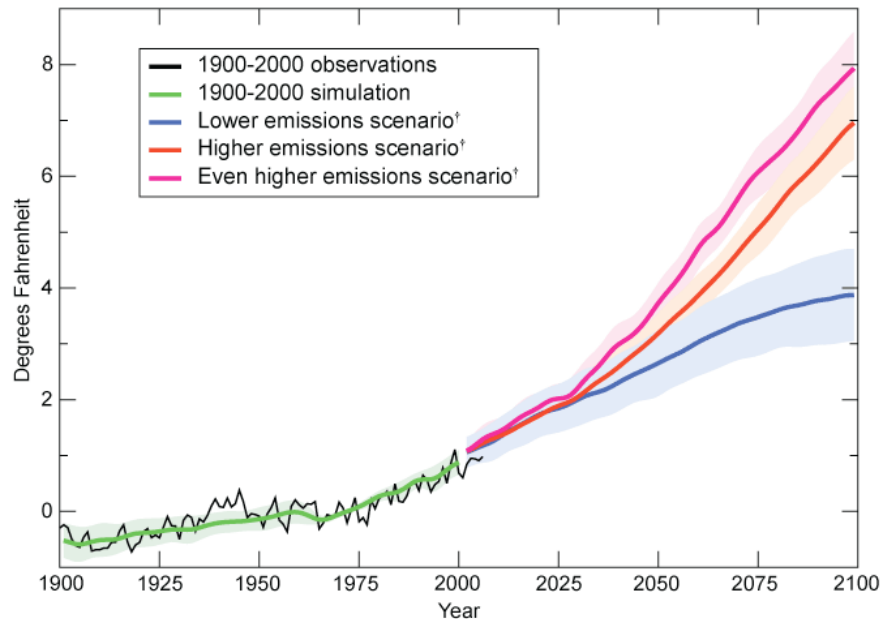


800,000 Years of CO2



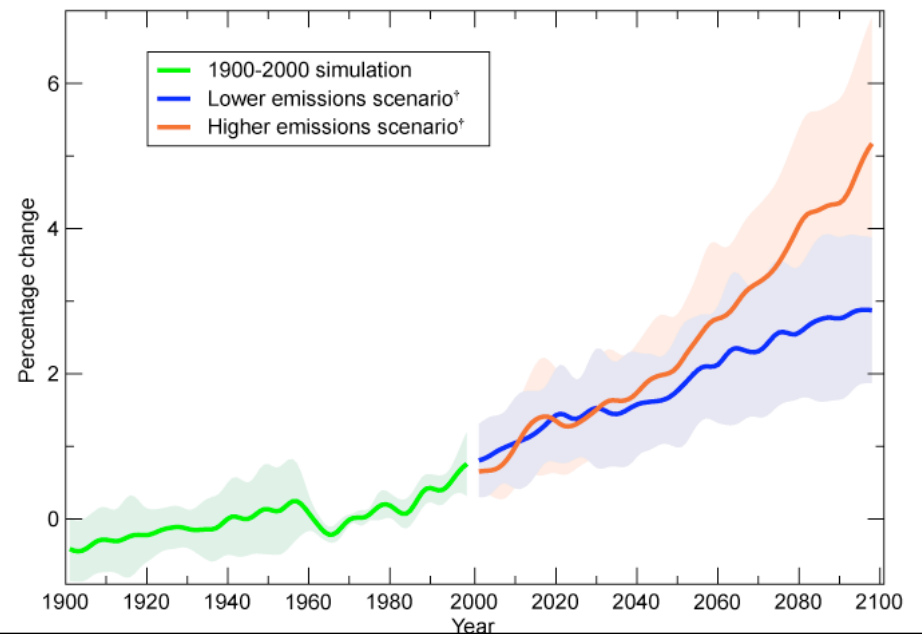
2. Climate changes are underway and projected to grow

Global Average Temperatures



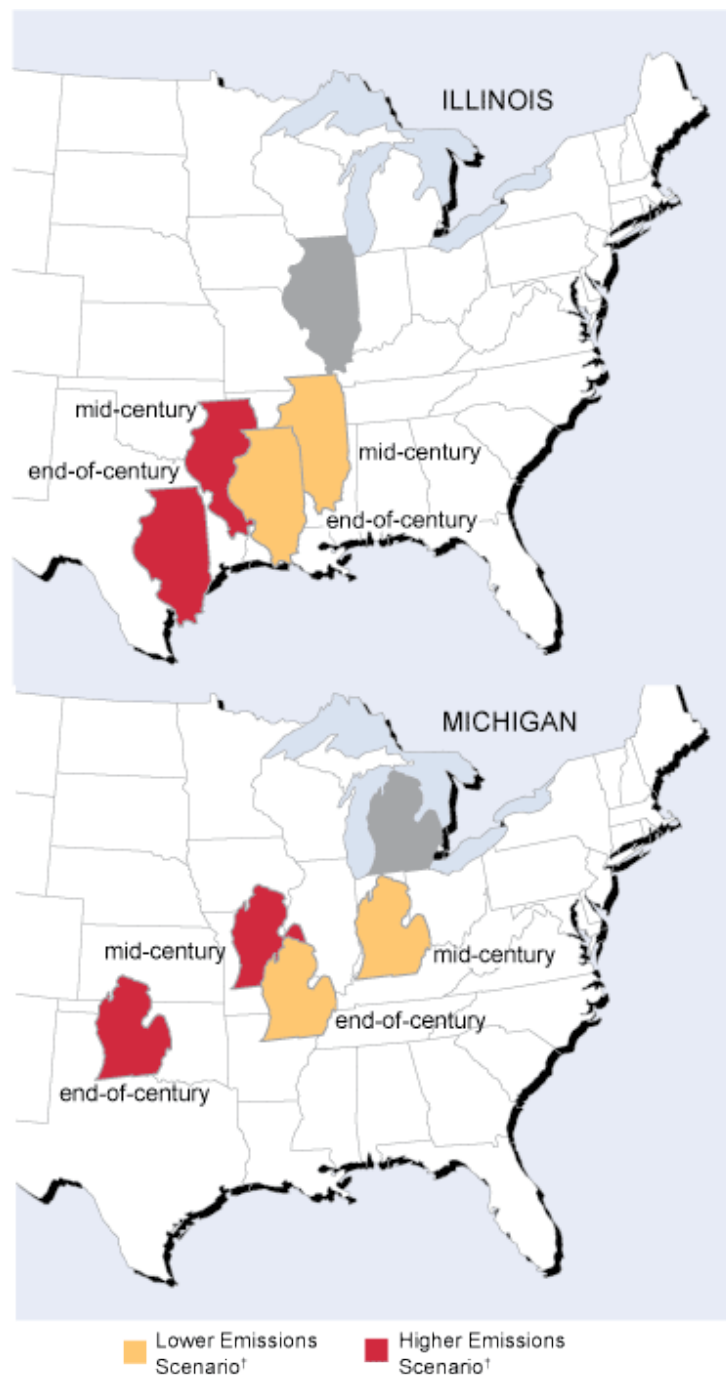
Source: CCSP (2009)

Heavy Precipitation



Shifting Summer Temperatures & Precipitation

2040-2059



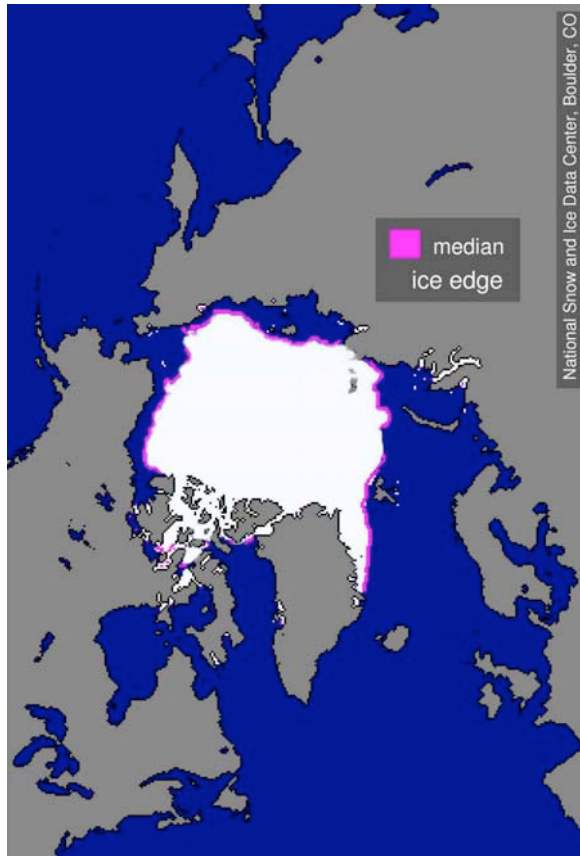
Source: CCSP (2009)

3. Widespread climate-related impacts are occurring now and will increase

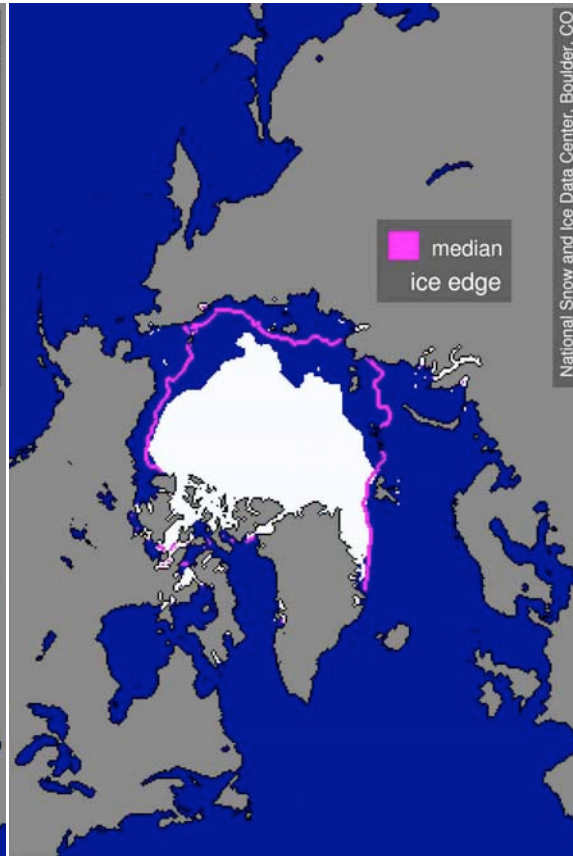
Median 1979-2000

September 21, 2005

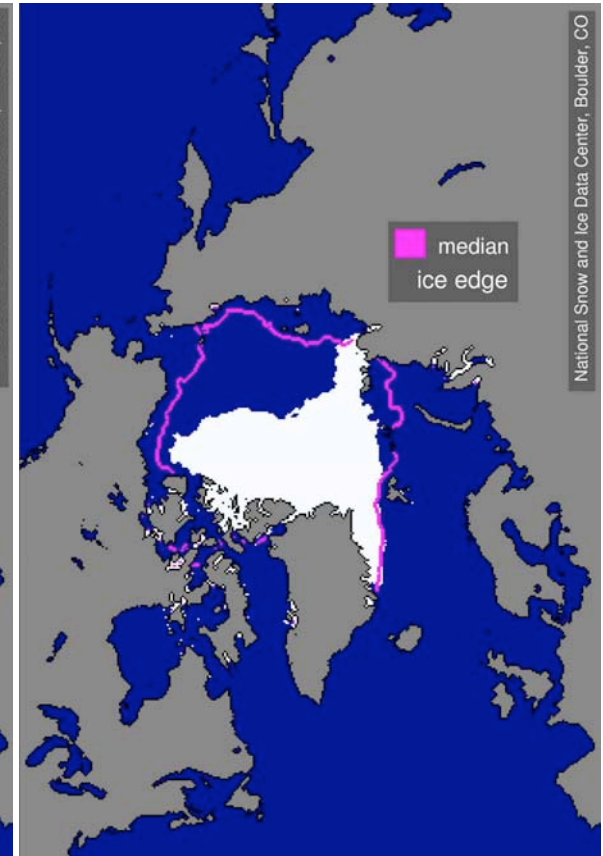
September 16, 2007



6.74 M square km



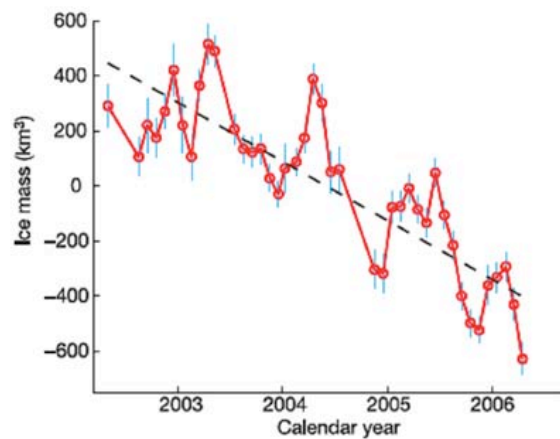
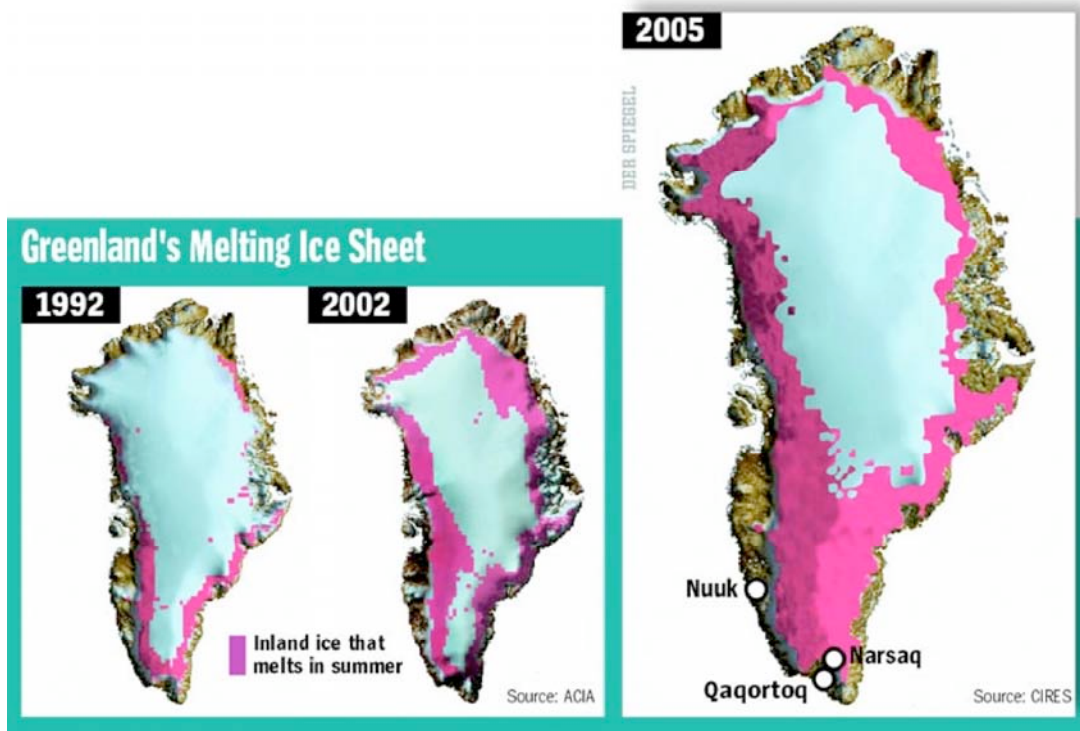
5.32 M square km



4.13 M square km

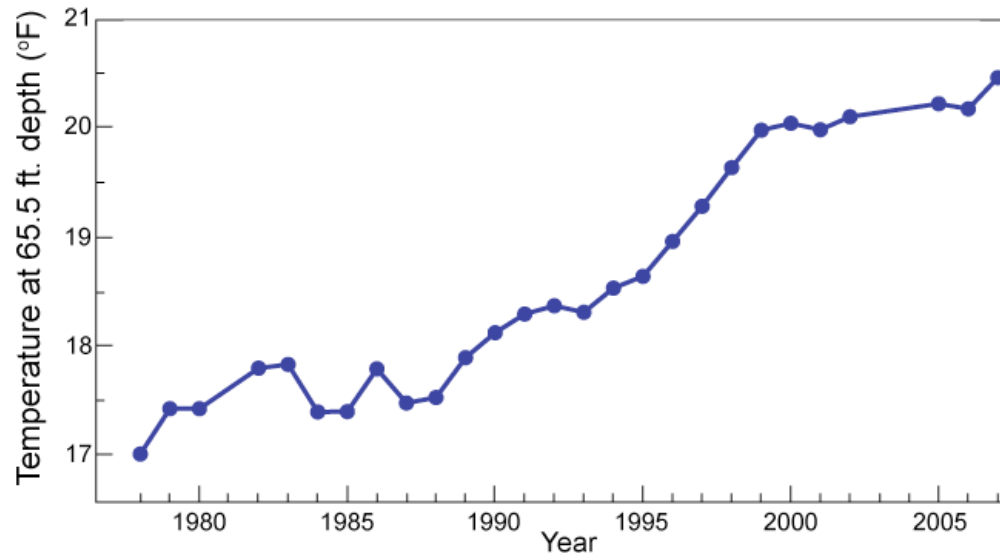
The difference between median minimum arctic ice coverage and the extent on Sept. 16, 2007 is **equal to the area of Alaska and Texas combined** (2.61 M sq. km or 1 M sq. miles). http://nsidc.org/news/press/2007_seaiceminimum/20070810_index.html

Fingerprints: Greenland



A 12-billion-gallon lake recently drained in 90 min (!) at the rate of Niagara Falls; sped up ice sheet

Fingerprints: Permafrost Disintegration

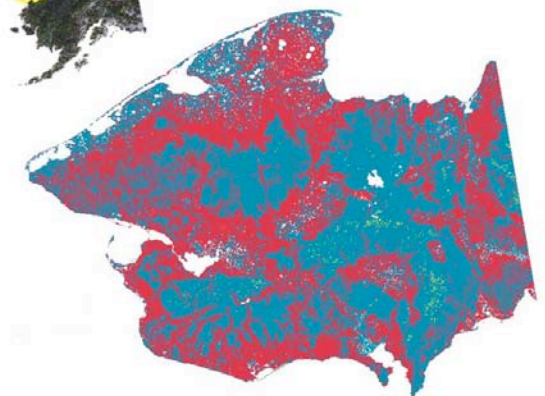
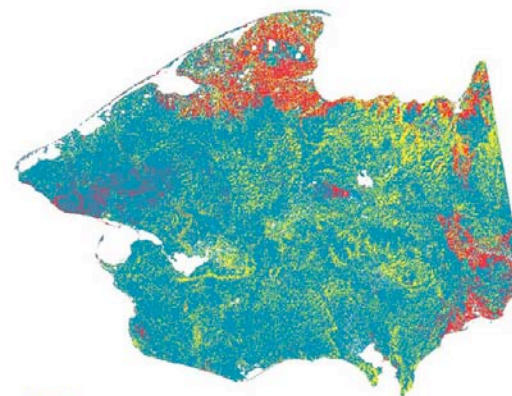


Permafrost temperatures have risen throughout Alaska, with the largest increases in the northern part of the state.

Current

Seward Peninsula

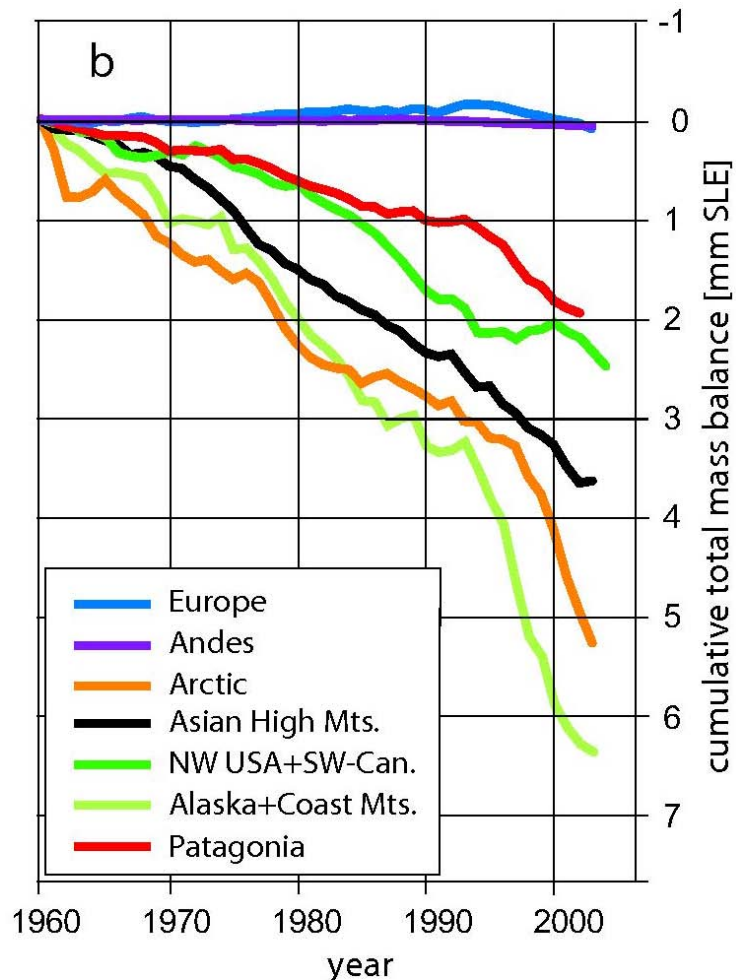
Projected:
Late this Century



- Continuous (90 to 100% of land area frozen)
- Discontinuous (10 to 90% of land area frozen)
- Thawing/Permafrost Free

Source: CCSP (2009)

Fingerprints: Glaciers



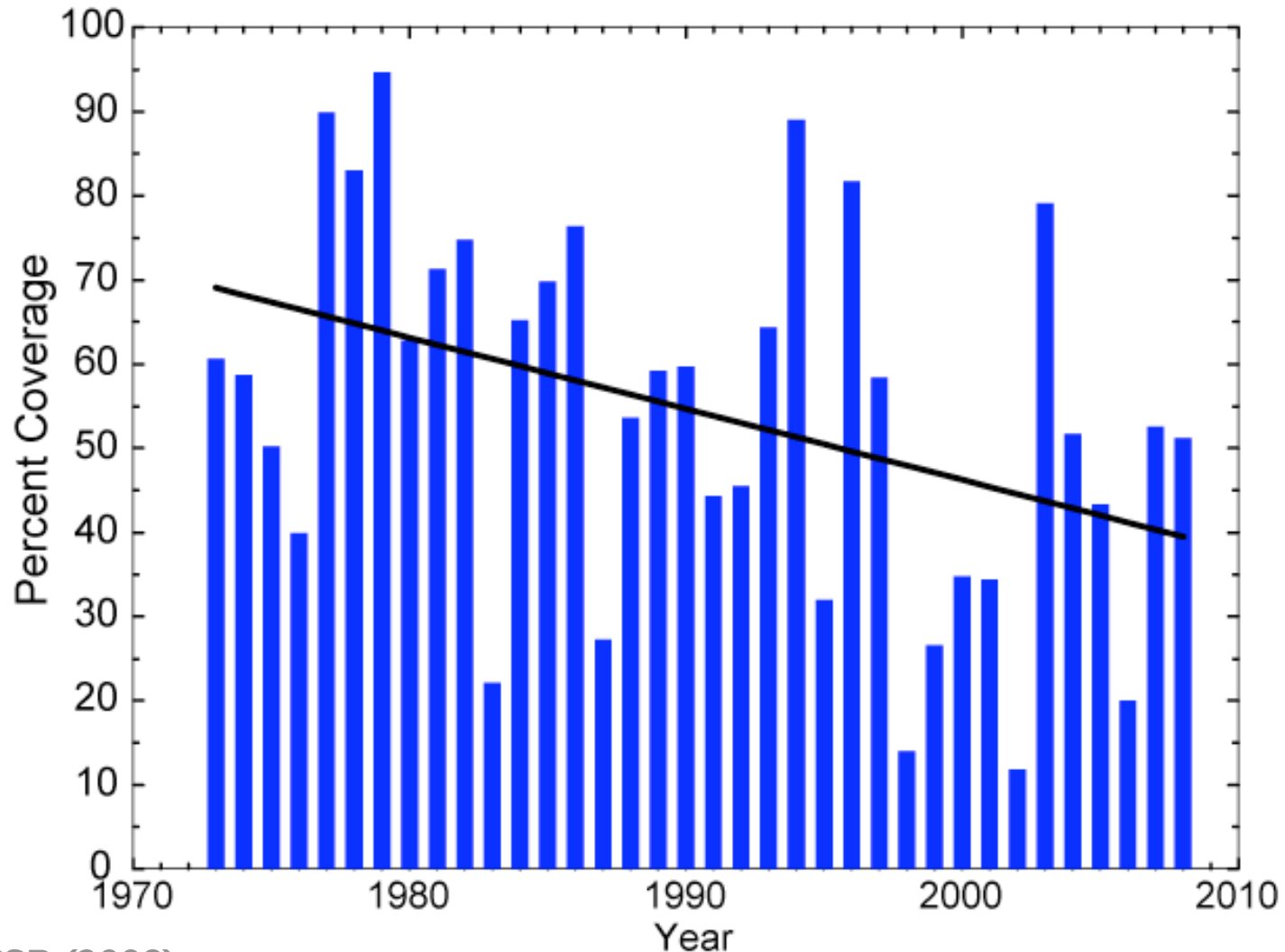
Loss Accelerating since early 1990s

Source: IPCC 4th Assessment (2007)



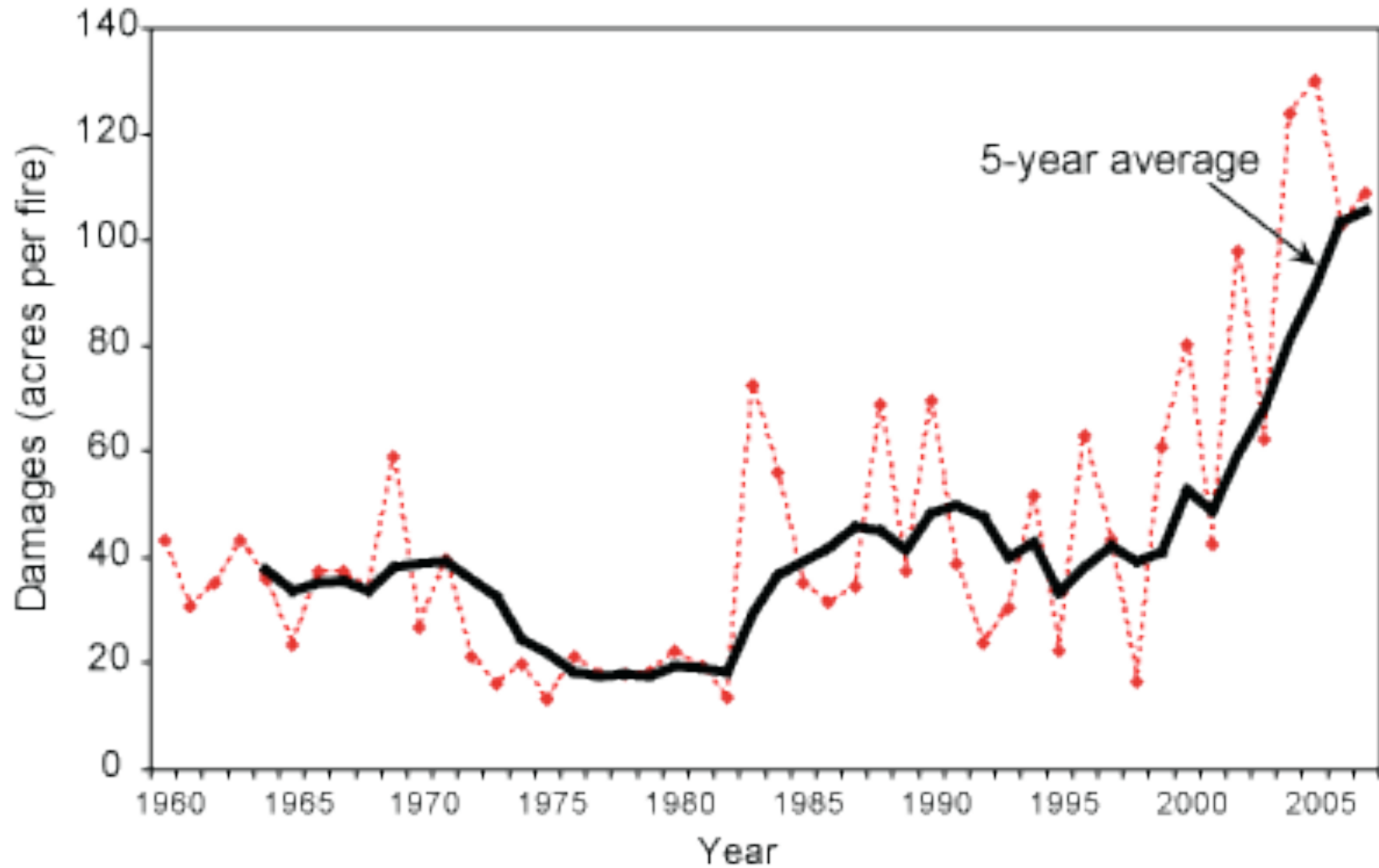
Fingerprints: Great Lakes Ice

Observed Changes in Great Lakes Ice Cover
Seasonal Maximum Coverage



Source: CCSP (2009)

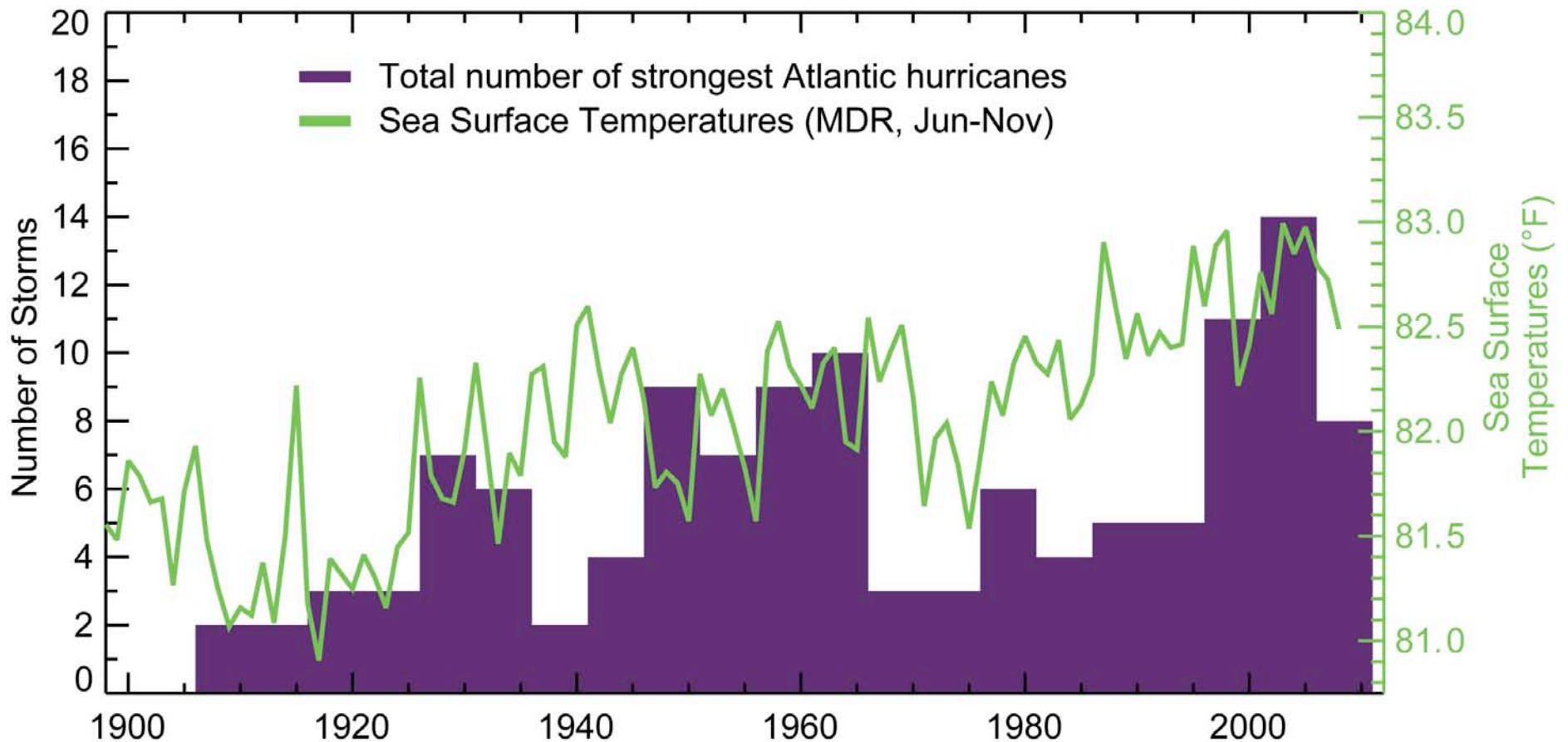
Fingerprints: Wildfire Intensity



Source: CCSP (2009)

Fingerprints: Cyclonic Storms

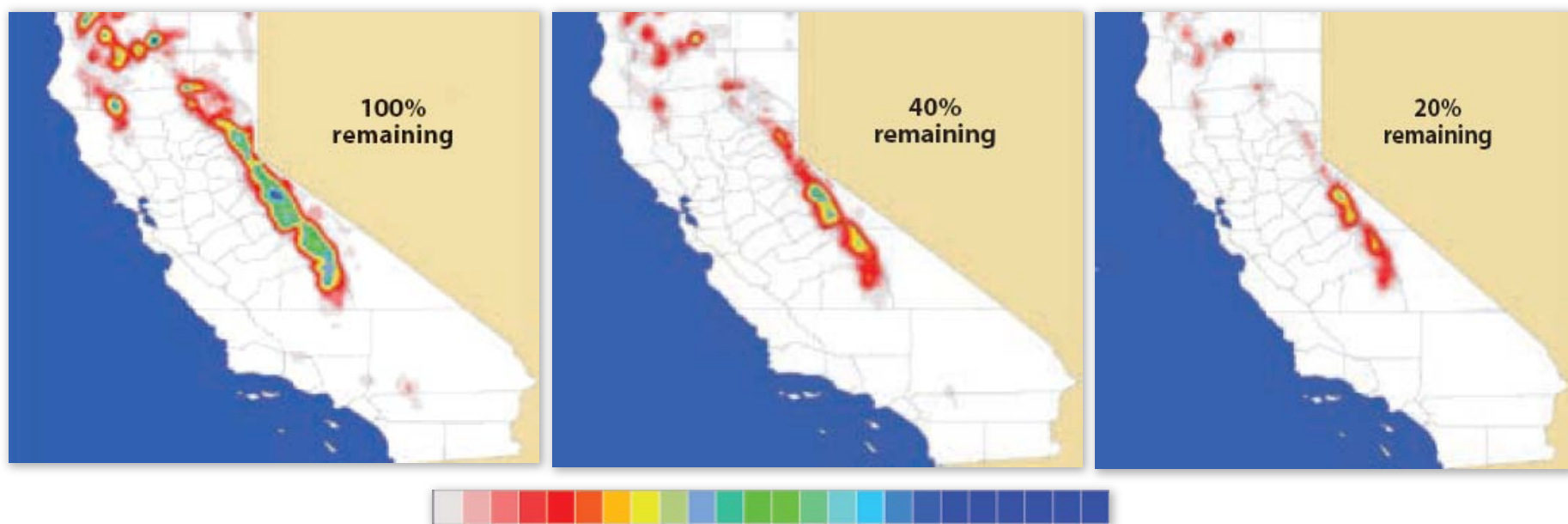
Atlantic Hurricanes Strongest Hurricanes (Cat. 4 and 5)



Source: CCSP (2009)

4. Climate change will stress water resources

Forecast Decrease in Sierra Nevada Snowpack



5. Crop and livestock production will be increasingly challenged

Weed Growth (*with* herbicides)

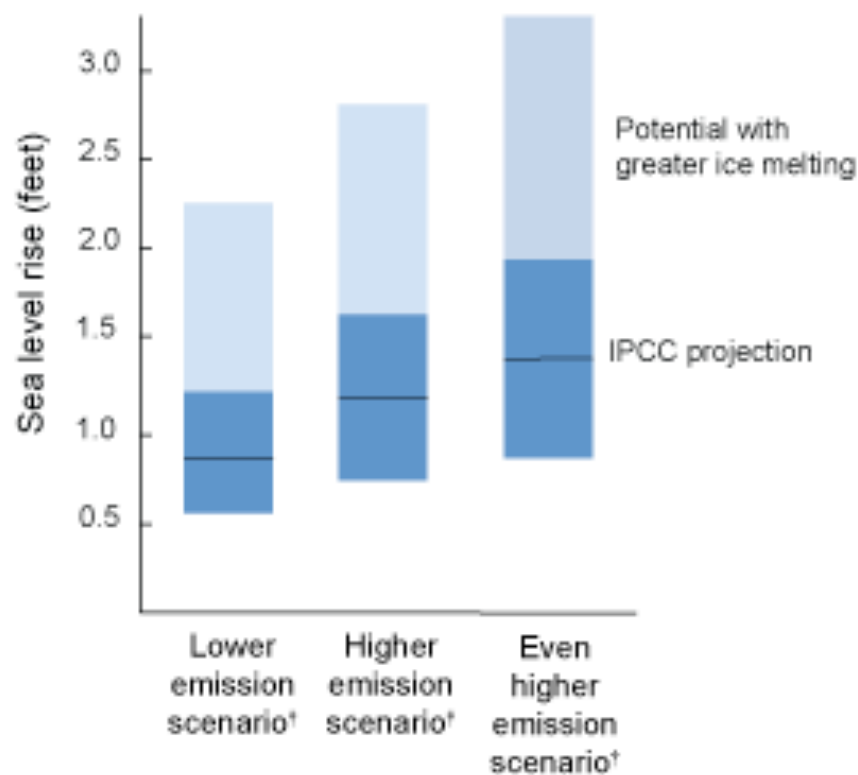
Ambient CO₂

Future CO₂ (+300 ppm)

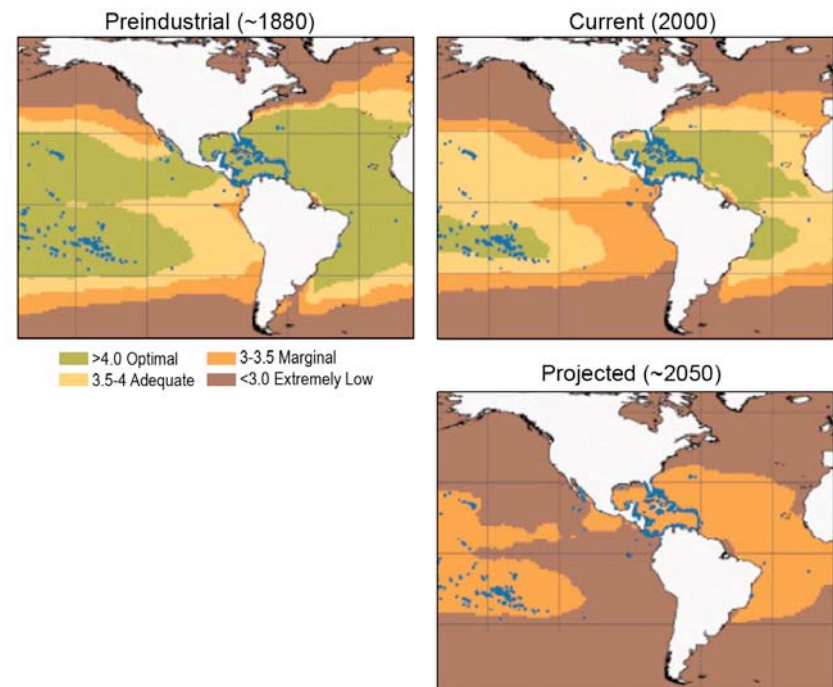


Source: CCSP (2009)

6. Coastal areas are at increasing risk from sea-level rise, storm surge, and other climate-related stresses



Ocean Acidification



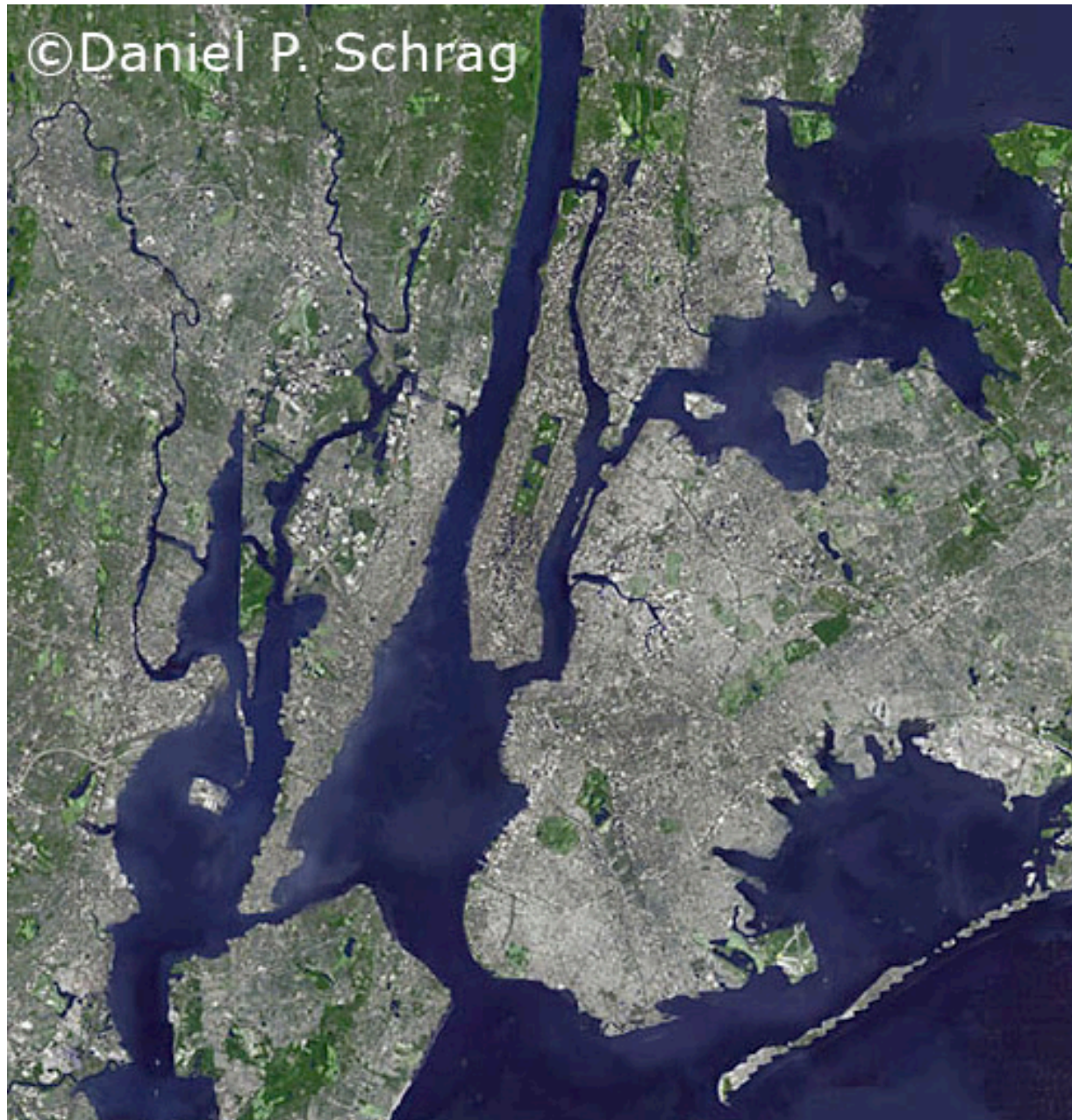
Source: CCSP (2009)

Sea-level Rise = 10 feet = half of Greenland melting



(Source:
Harvard University)

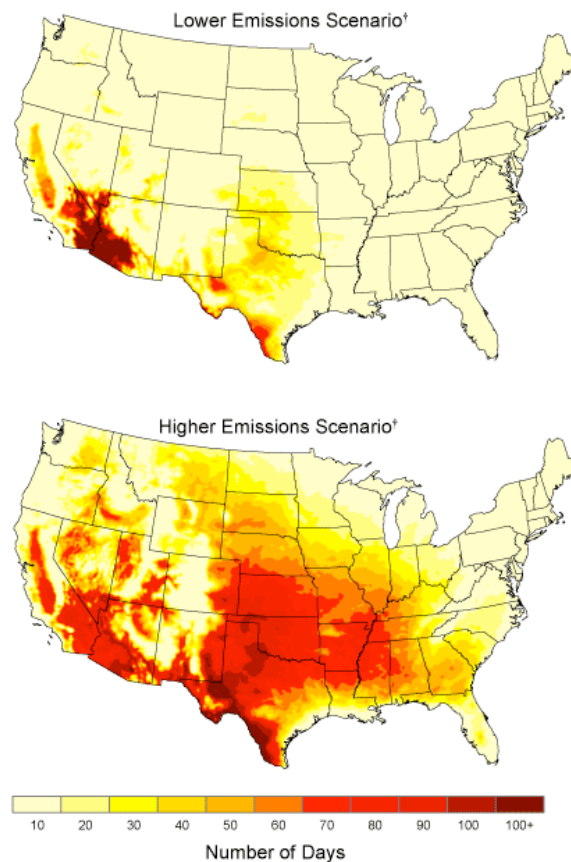
Sea-level Rise = 10 feet = half of Greenland melting



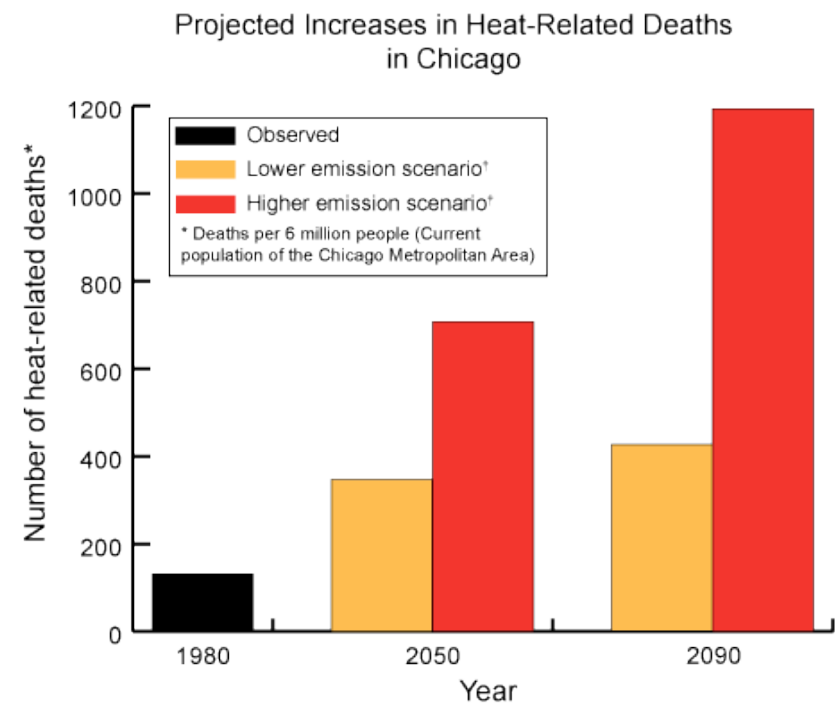
(Source:
Harvard University)

7. Threats to human health will increase

Projected Increase in Number of Days with Heat Index over 100°F



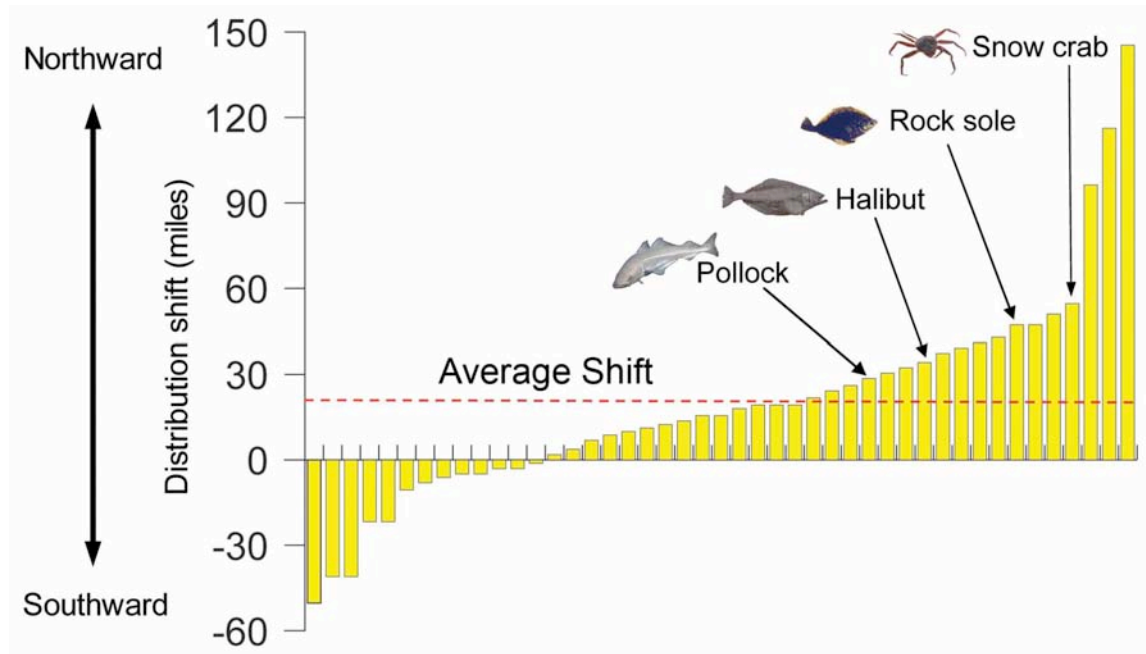
Projected Increase in Heat-Related Deaths in Chicago



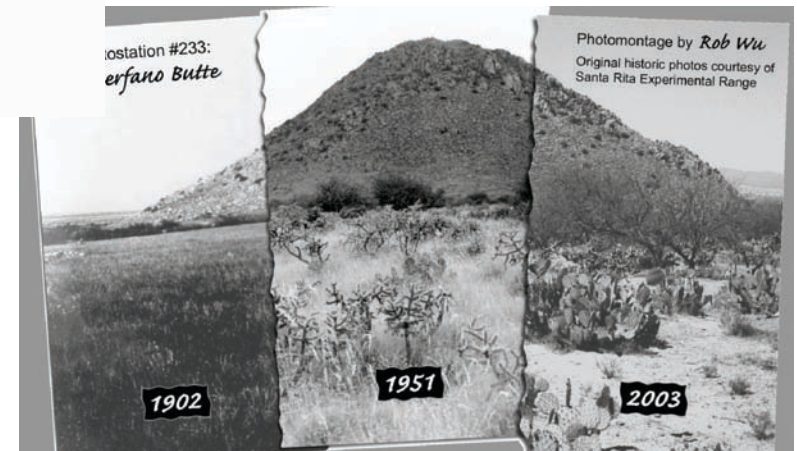
Source: CCSP (2009)

8. Climate change will interact with many social and environmental stresses

Ocean species shift: 1982-2006

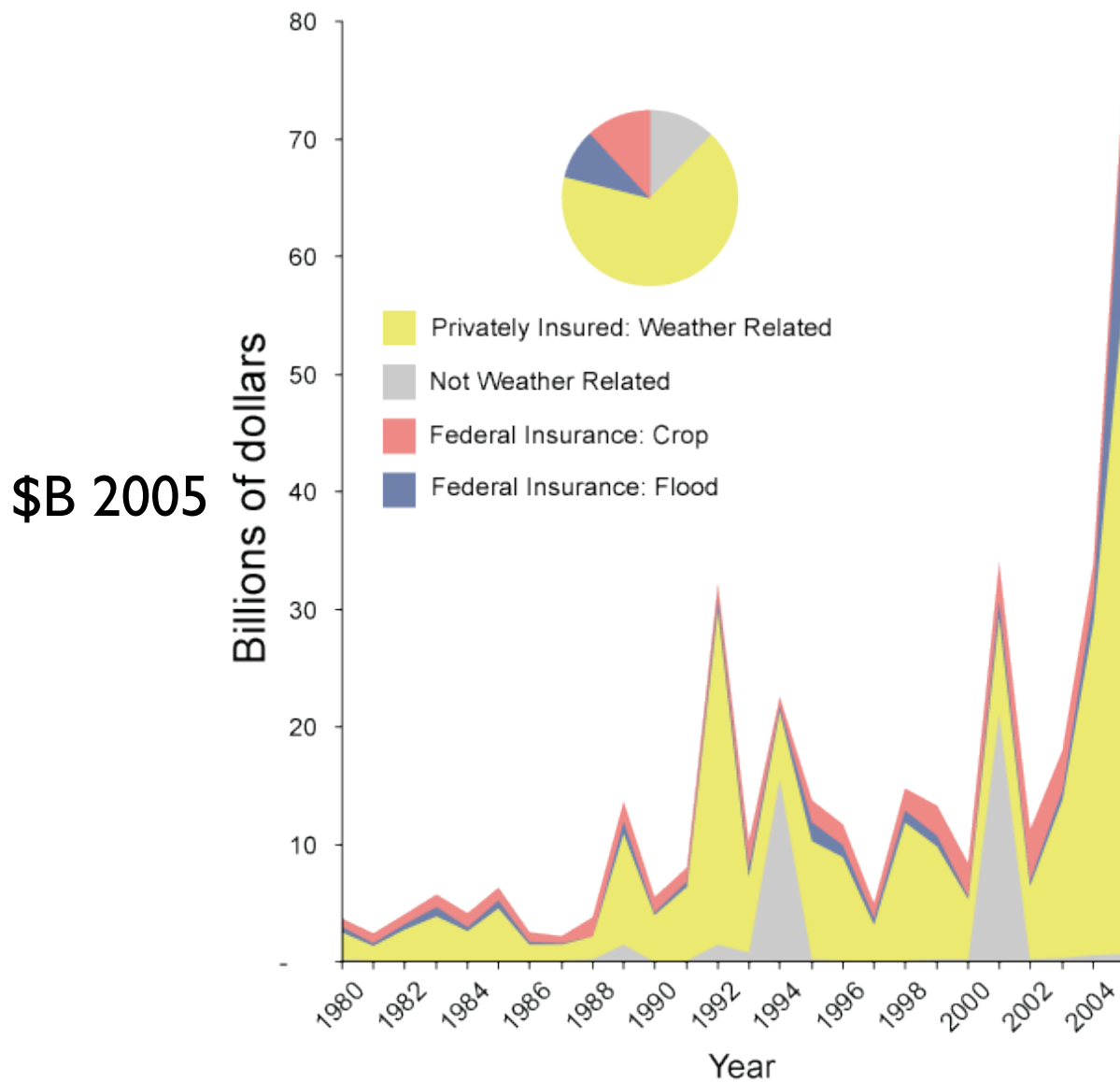


Desertification of Arid Grassland





Source: CCSP (2009)

Insured \$ Losses from Catastrophes



Source: US Government Accountability Office


International Security

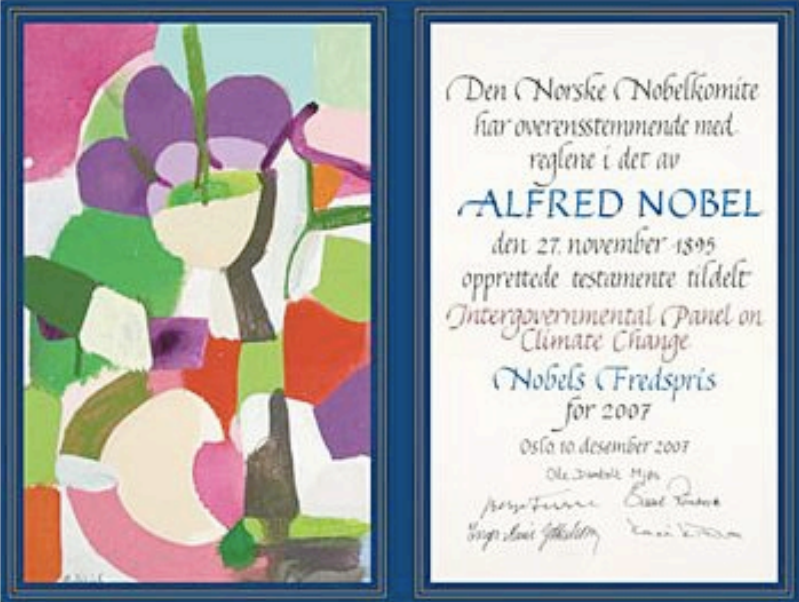


1 08520568465108546211597532584698461

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

The IPCC is honored with the Nobel Peace Prize


© The Nobel Foundation

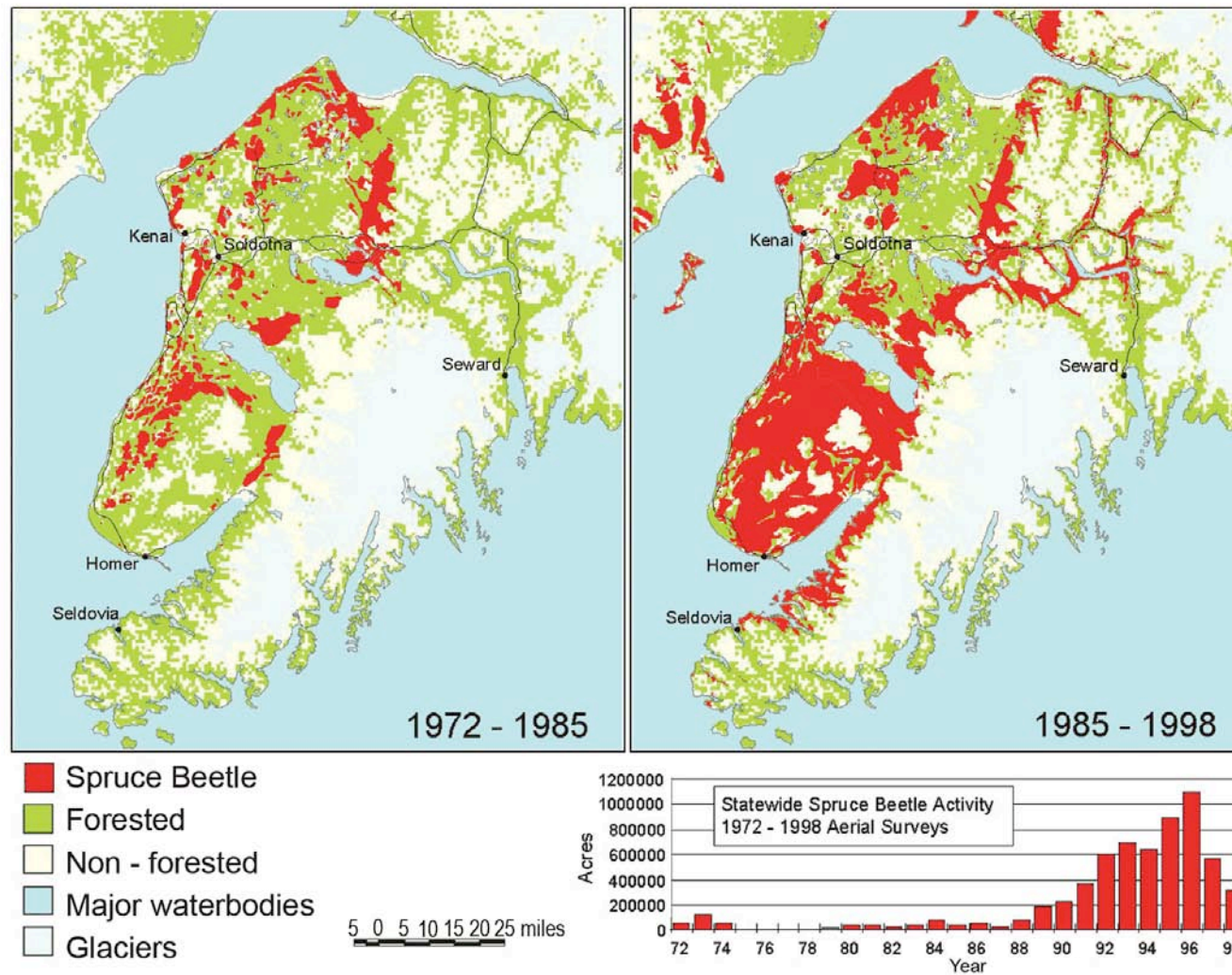


Den Norske Nobelkomite
har overensstemmende med
reglene i det av
ALFRED NOBEL
den 27. november 1895
opprettede testamente tildelt
Intergovernmental Panel on
Climate Change
Nobels Fredspris
for 2007
Oslo 10. desember 2007
Ole Jacob Mjølhus
Per Fønne Bjørn Rønne
Svein Olav Skjolden

Oslo, 10 December 07
The Intergovernmental Panel on Climate Change
and Albert Arnold (Al) Gore Jr.
were awarded of **the Nobel Peace Prize**
"for their efforts to build up and disseminate greater
knowledge about man-made climate change, and to
lay the foundations for the measures that are
needed to counteract such change".

- | [Speech of the IPCC Chairman at the Award Ceremony](#)
- | [More information](#)

9. Thresholds will be crossed, leading to large changes in climate and ecosystems



Source: CCSP (2009)

Larsen-B Ice Sheet



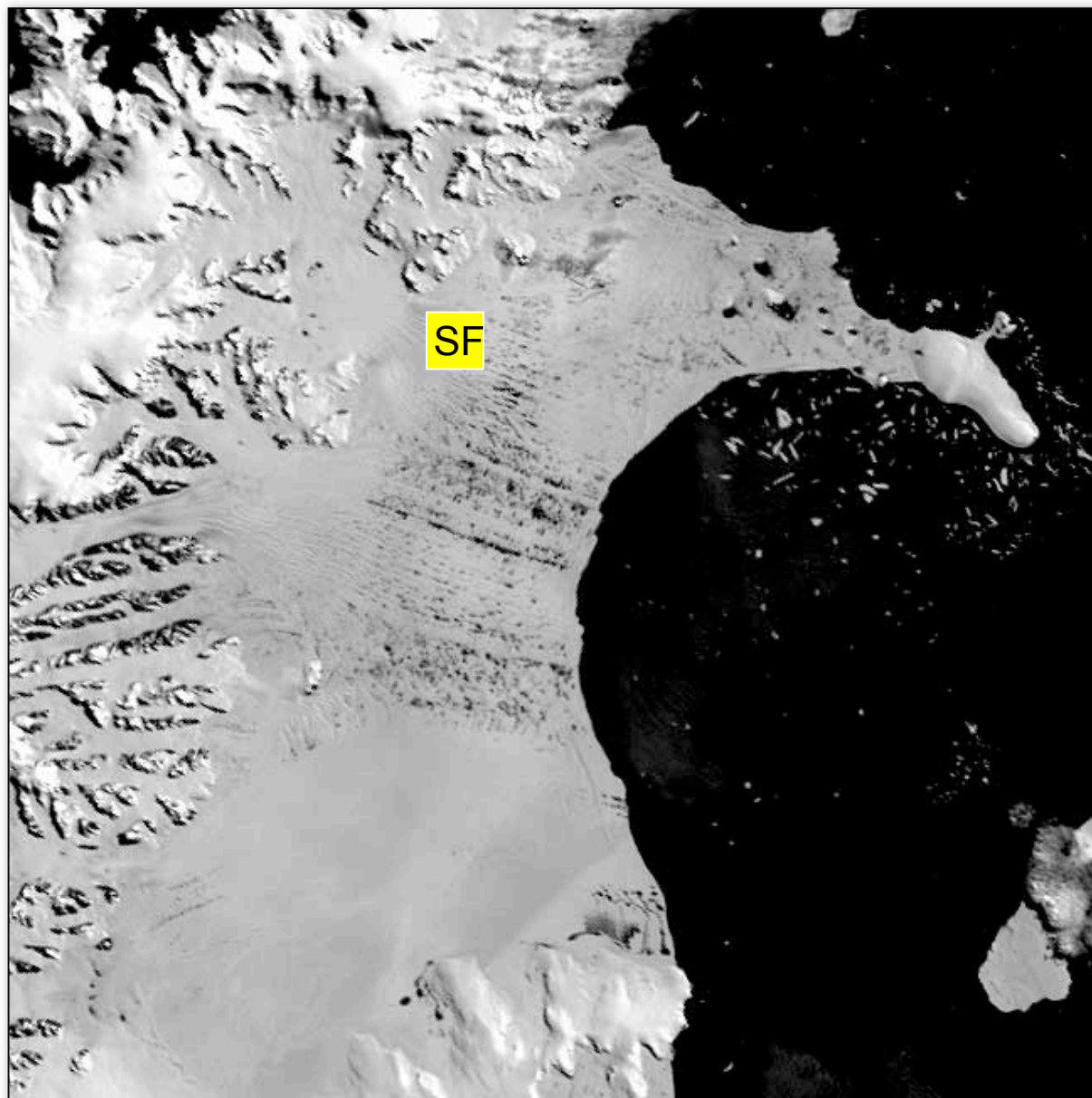
Image NASA

©2006 Google

Pointer 87°32'33.79" S 86°21'17.38" E

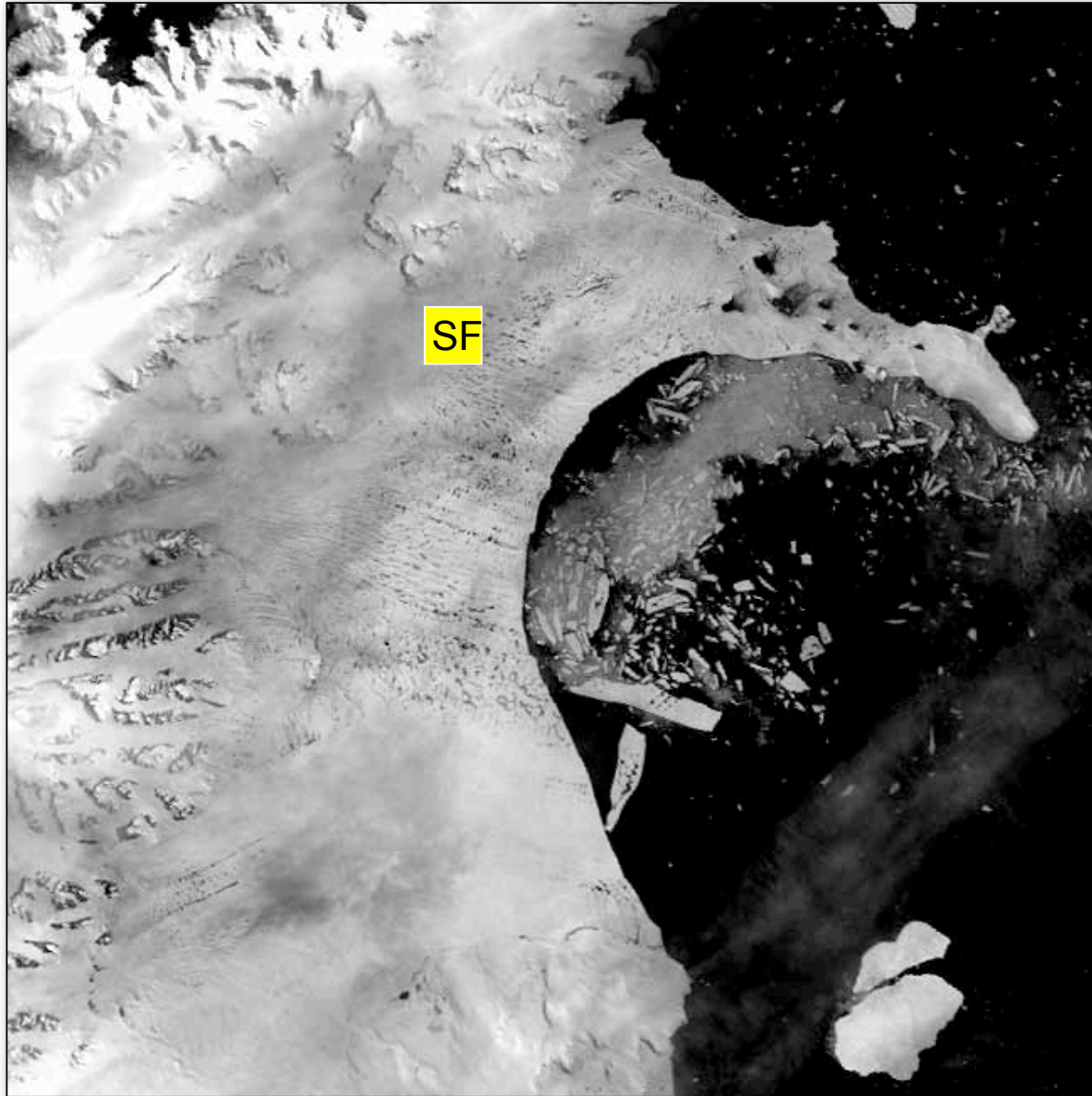
Streaming ||||| 100%

Eye alt 8466.64 km

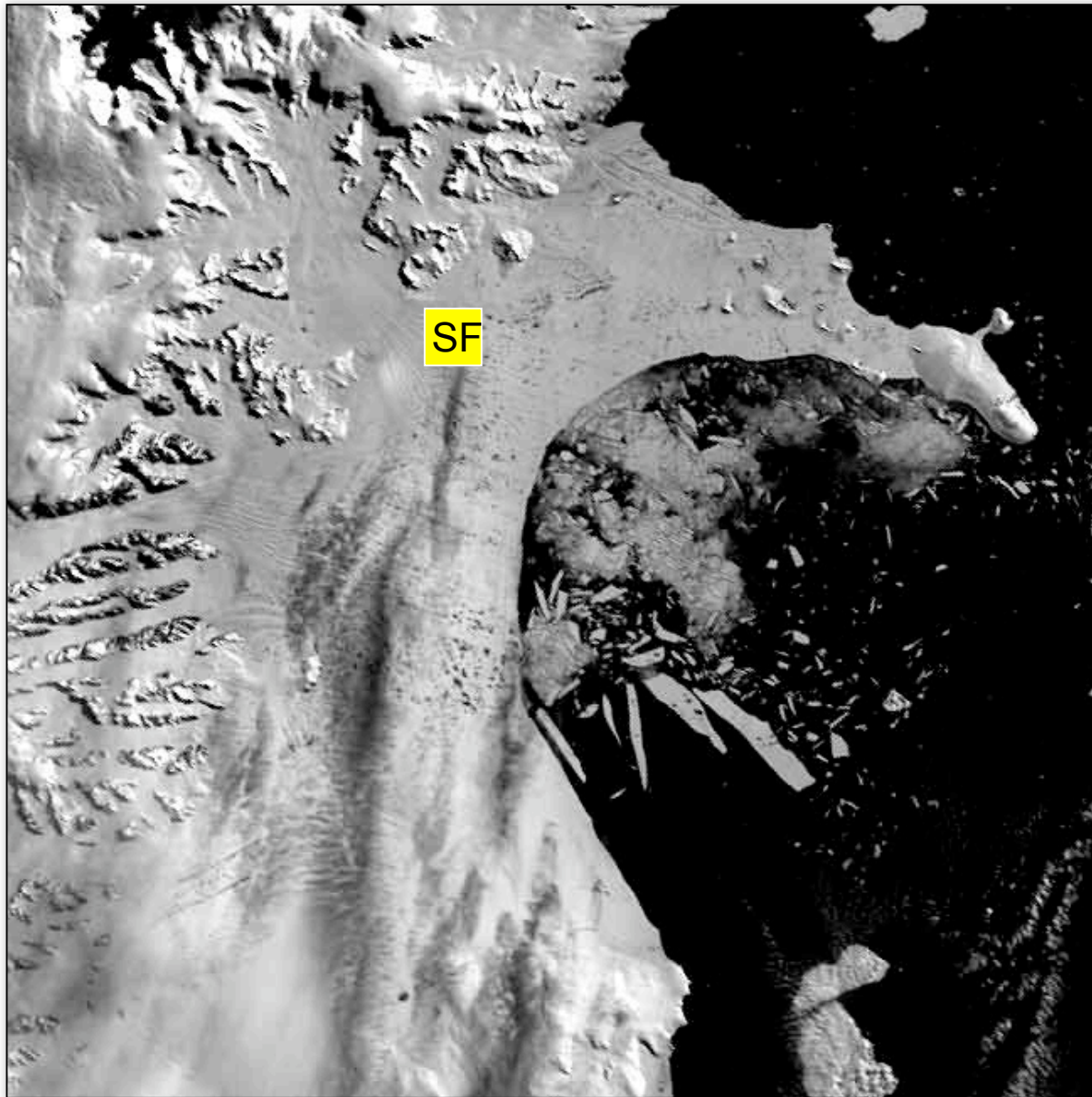


Jan 31
2002

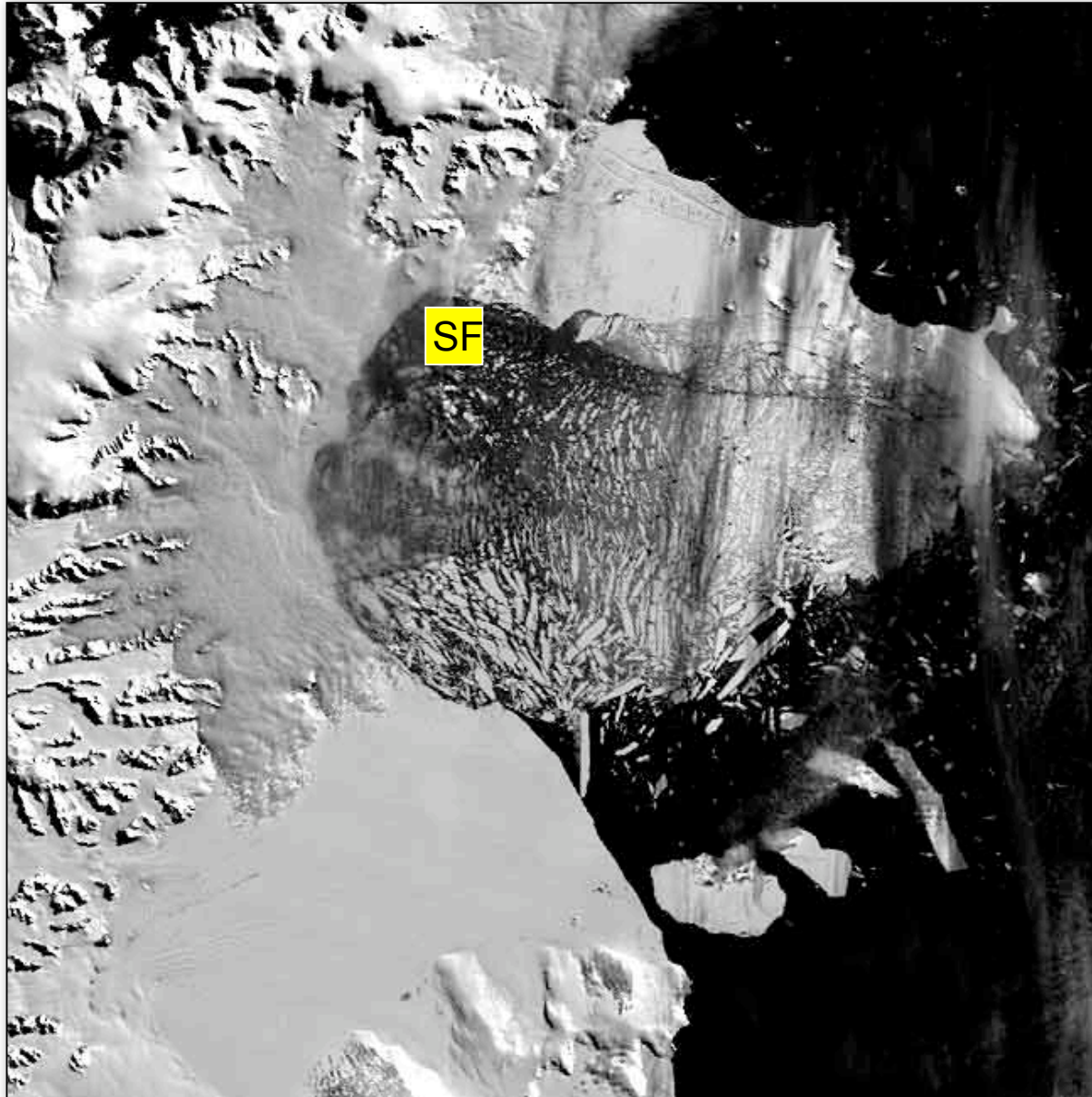
Larsen B
Ice Shelf



Feb 17



Feb 23



March 5

1255
square
miles
[24x San
Francisco]

650 feet
thick [4.3
Lake Tahoes]

720 billion
tons

Subsequent
8x increase in
outflow glacier
speed

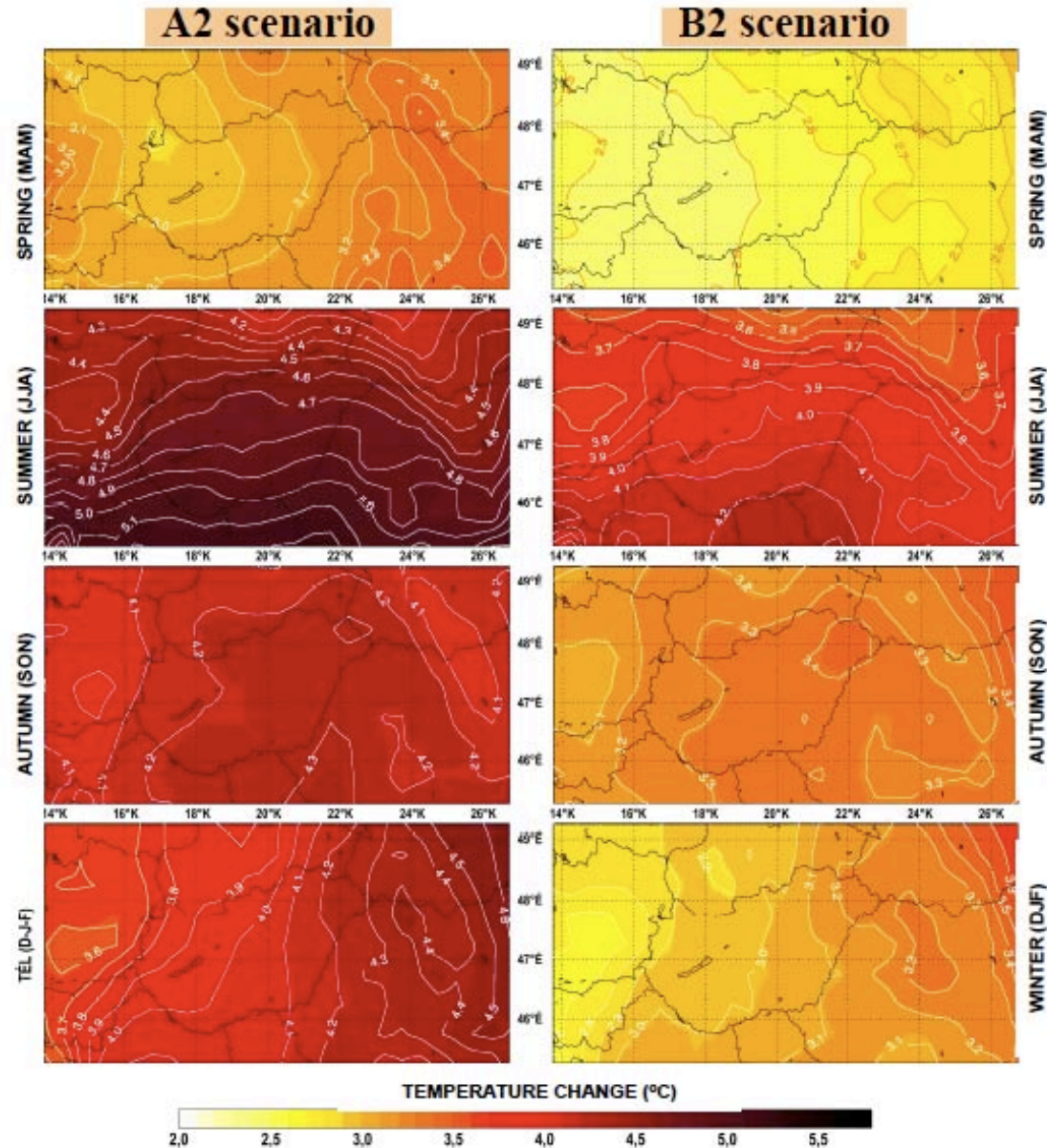
10. *Future climate change and its impacts depend on choices made today*

**CLIMATE CHANGE 2007: IMPLICATIONS FOR HUNGARY
IPCC OUTREACH EVENT --- CEU, Budapest 10-11 April 2008**

CLIMATE CHANGE OBSERVATIONS AND PROJECTIONS IN HUNGARY

**Judit Bartholy, Rita Pongrácz,
Györgyi Gelybó, Péter Szabó**





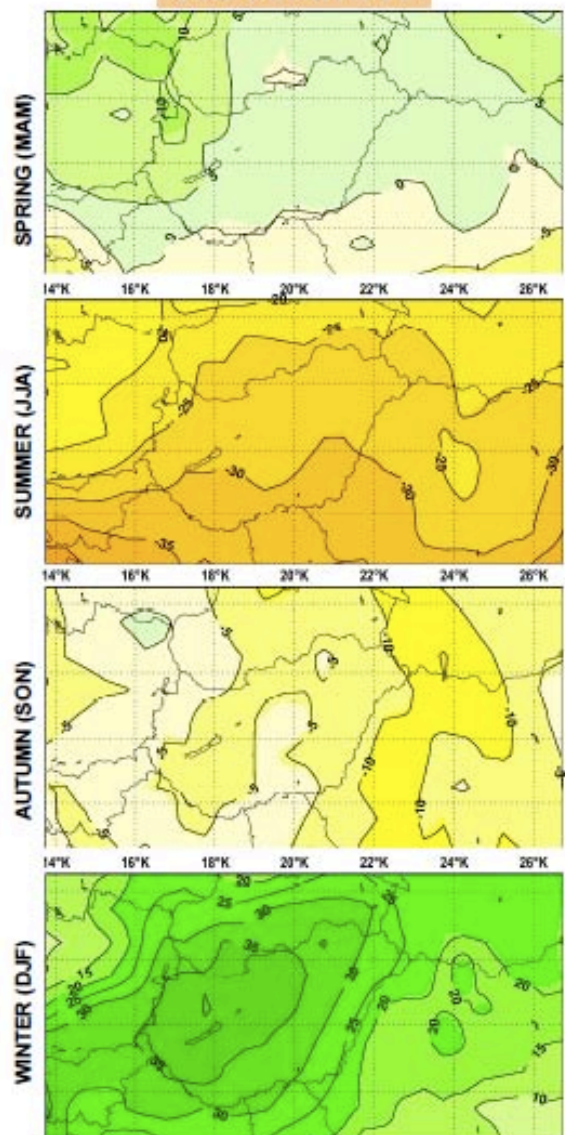
**Expected
temperature
change for the
Carpathian Basin**

**Comparison of
A2 and B2
scenario
(16, and 8
model outputs)**

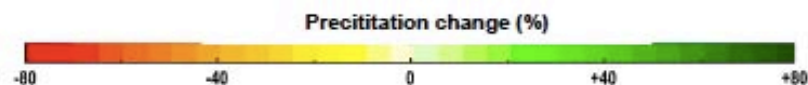
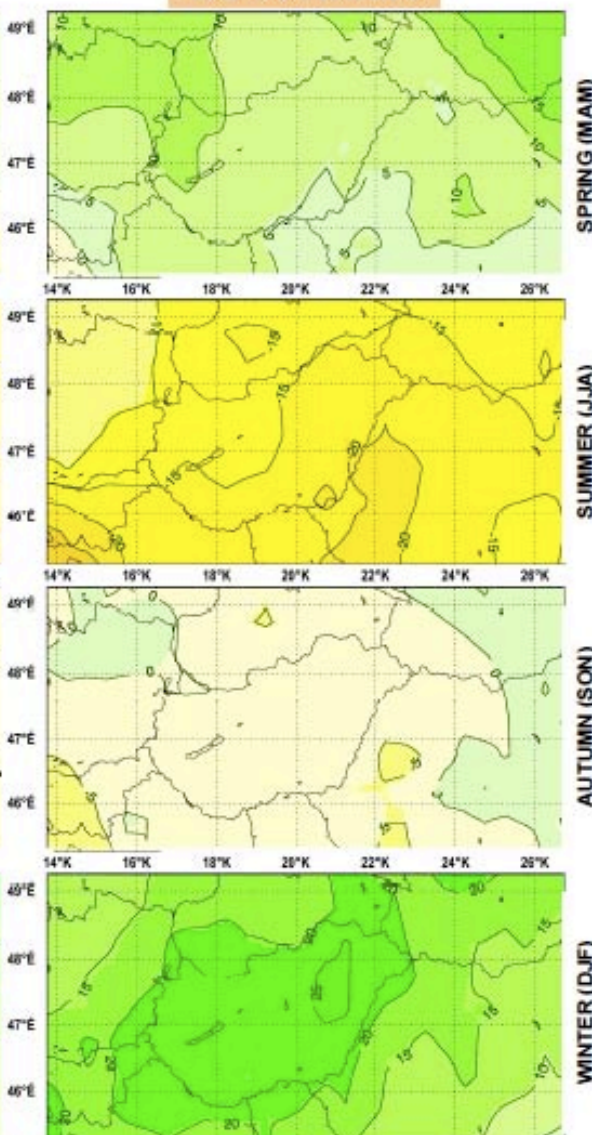
**PRUDENCE
2071-2100**

SUMMER – largest
A2: 4.5-4.9°C,
B2: 3.8-4.2°C
SPRING – smallest
A2: 2.9-3.2°C
B2: 2.5-2.6°C

A2 scenario



B2 scenario



**Expected
precipitation
change for the
Carpathian basin**

**Comparison of
A2 and B2
scenario
(16, and 8
model outputs)**

**PRUDENCE
2071-2100**

SUMMER – drier
A2: 25-30%,
B2: 10-20%
WINTER – wetter
A2: 25-35%
B2: 20-25%

Hungary

CENTER FOR CLIMATE CHANGE
AND SUSTAINABLE ENERGY POLICY



CENTRAL EUROPEAN UNIVERSITY

3CSEP is:

- ❖ ***an interdisciplinary research and educational center at Central European University (CEU) whose mission is***
 - ❑ ***to foster solutions to climate change and sustainable energy challenges***
 - ❑ ***while advancing the implementation of development agendas.***
- ❖ ***3CSEP also provides a platform for academic, outreach and educational activities at CEU in these fields.***

Response Options

- **Mitigate**
- **Adapt**
- **Suffer**

Reduce our Carbon Footprint



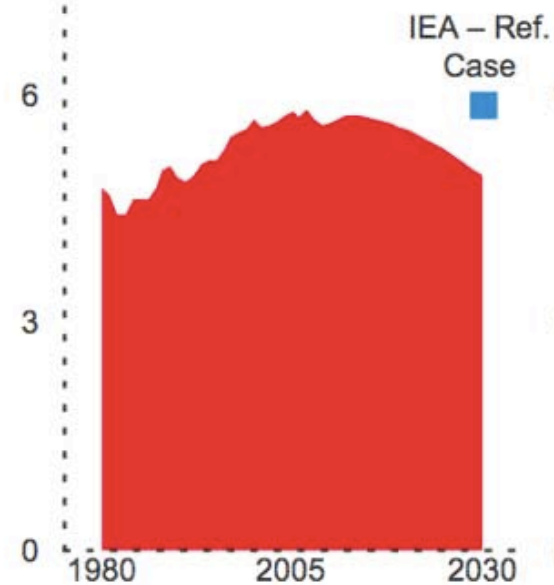
CO₂ outlook by region



United States

billion tonnes

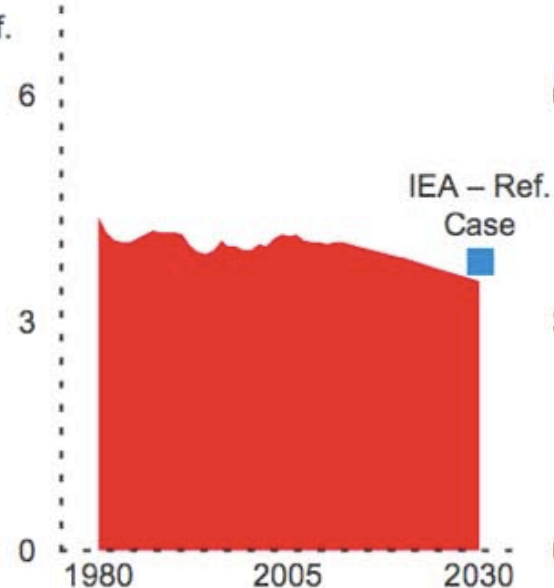
Average Growth / Yr.
2005 – 2030
-0.6%



European Union

billion tonnes

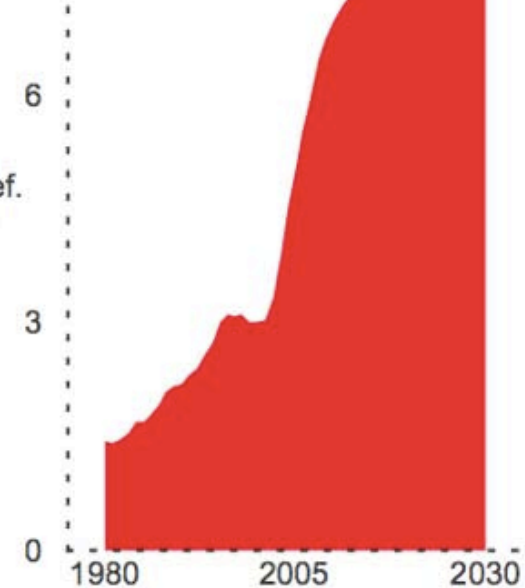
Average Growth / Yr.
2005 – 2030
-0.6%



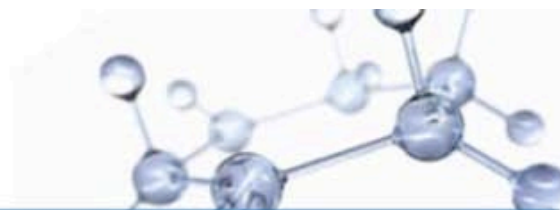
China

billion tonnes

Average Growth / Yr.
2005 – 2030
2.1%

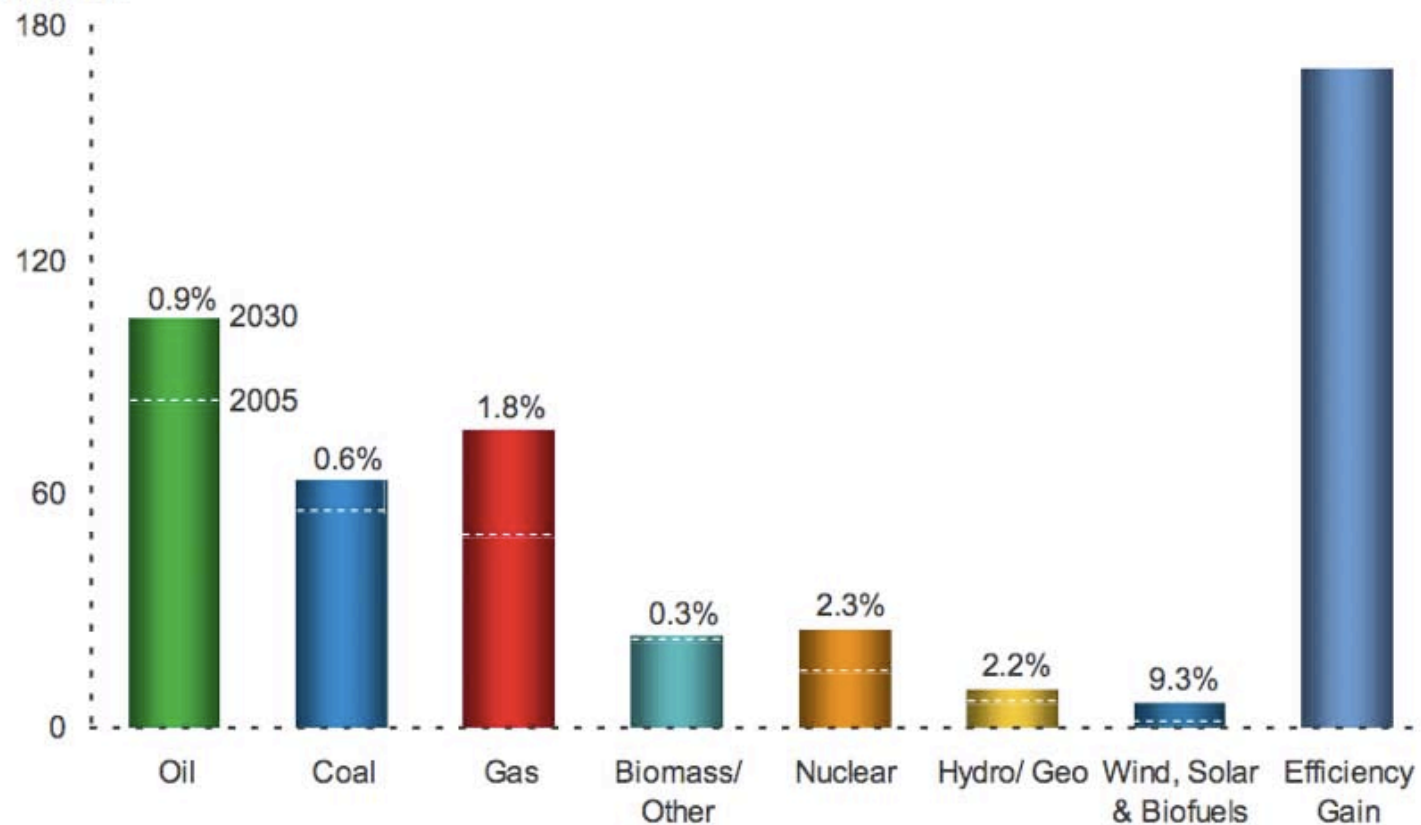


growing global energy demand

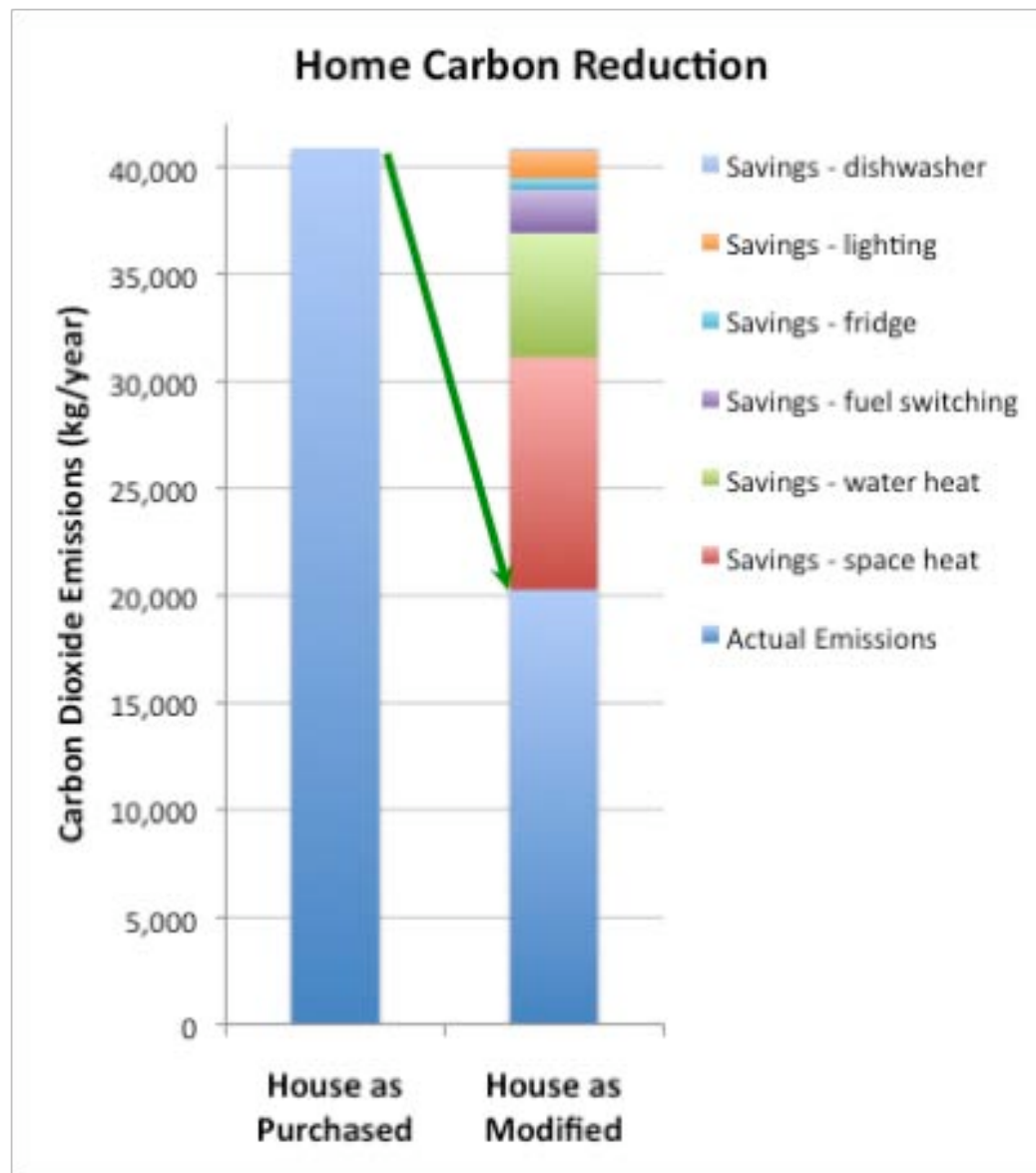


growing global energy demand

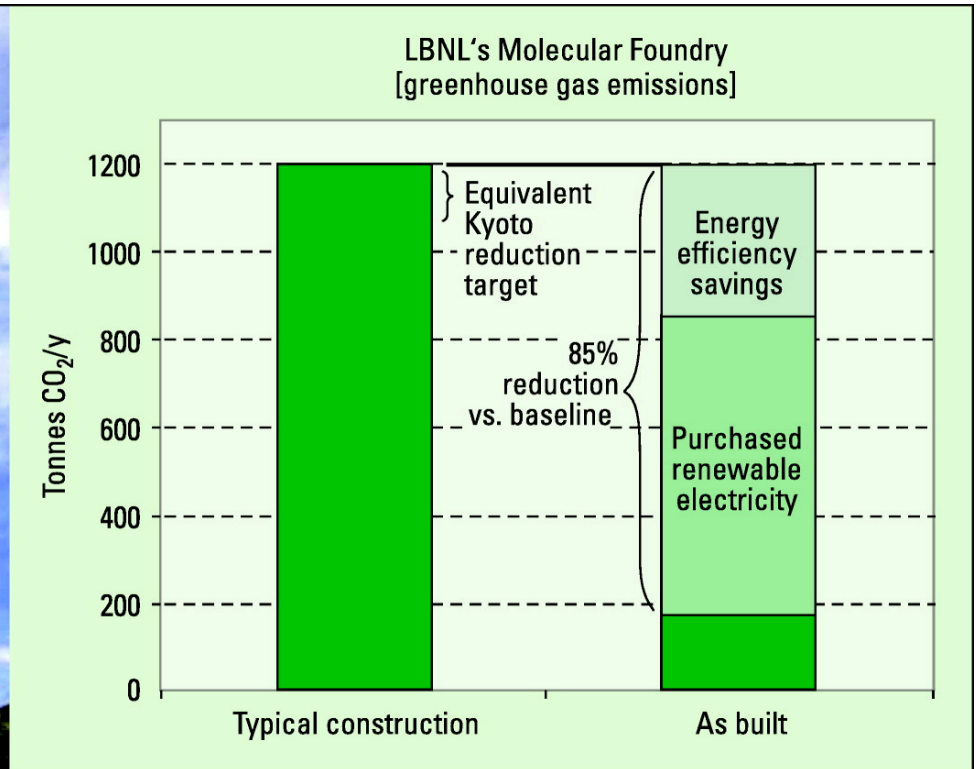
by fuel
MBDOE



Evan & Erika's Footprint



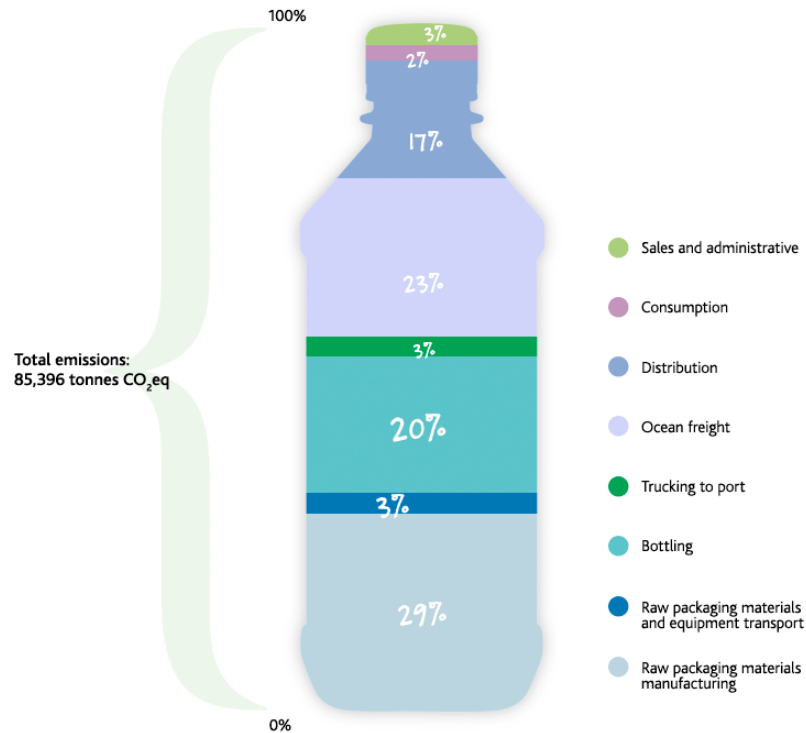
High Tech = High Efficiency



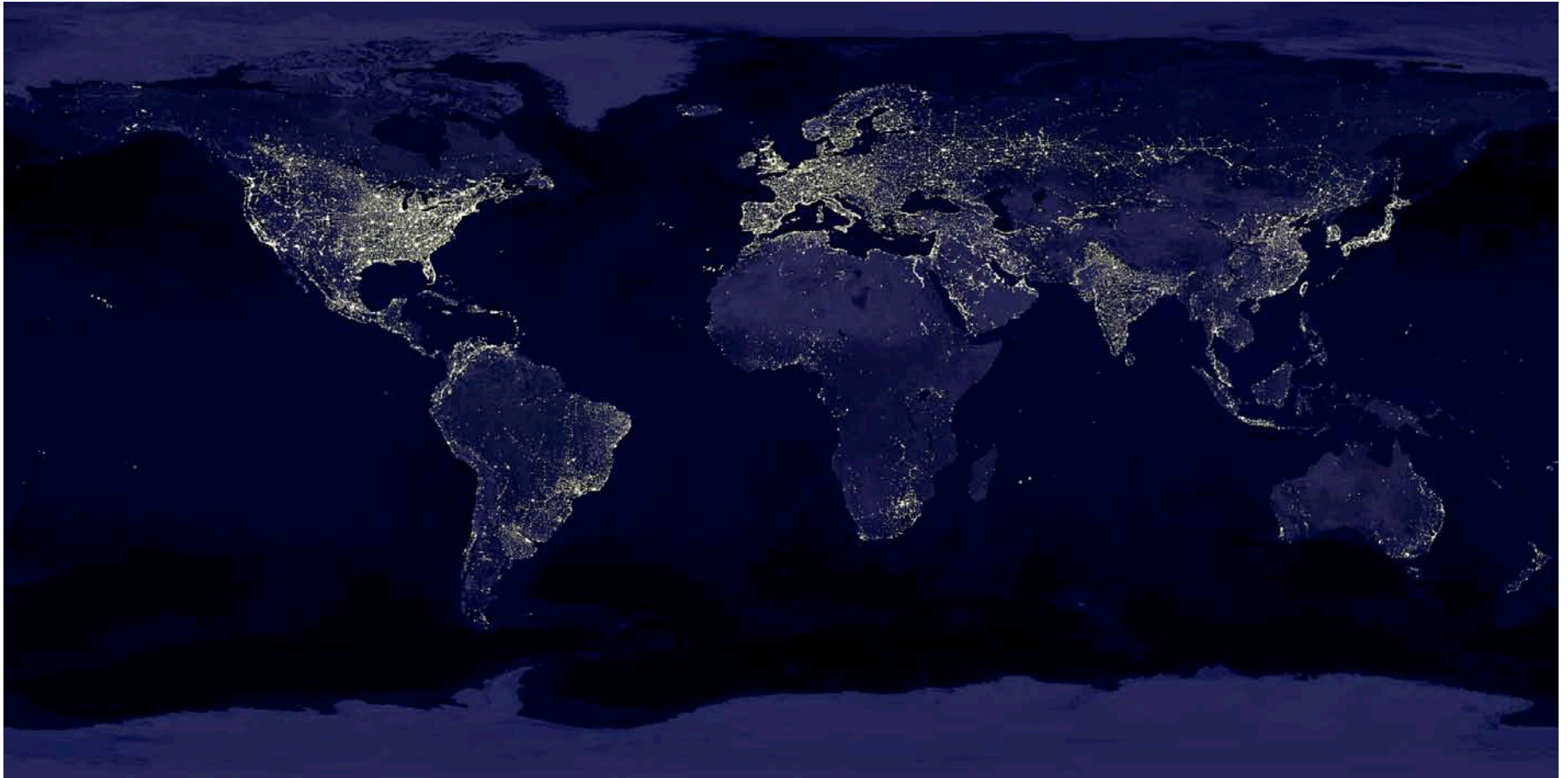
Cost to build was LESS than for typical construction

Carbon Footprinting

Base year carbon footprint
(tonnes CO₂eq)



Pent up Demand in Developing World



Kerosene Lighting in Developing World

- \$40 billion/year spent
- 1/10th of 1% of light provided
- 65 million cars worth of CO₂ emissions
- Solutions have payback time << 1 year



Stop Moving into Harm's Way

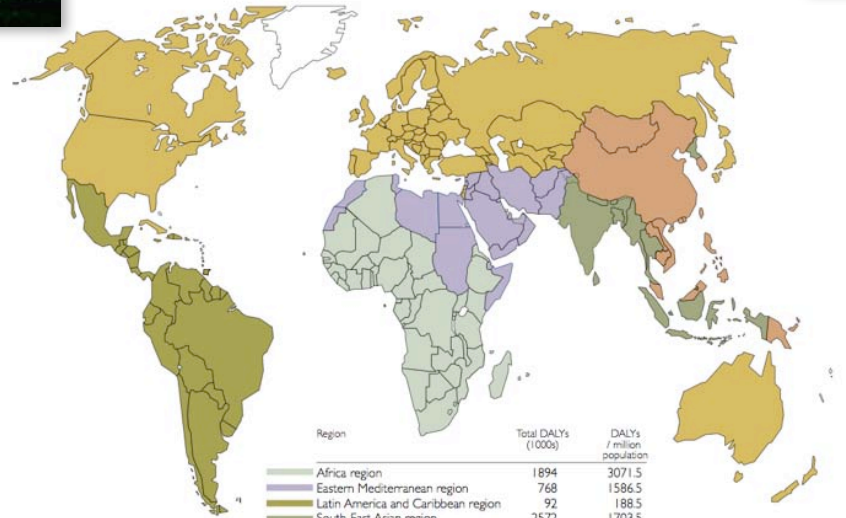
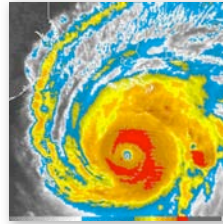


Beware “Maladaptation”



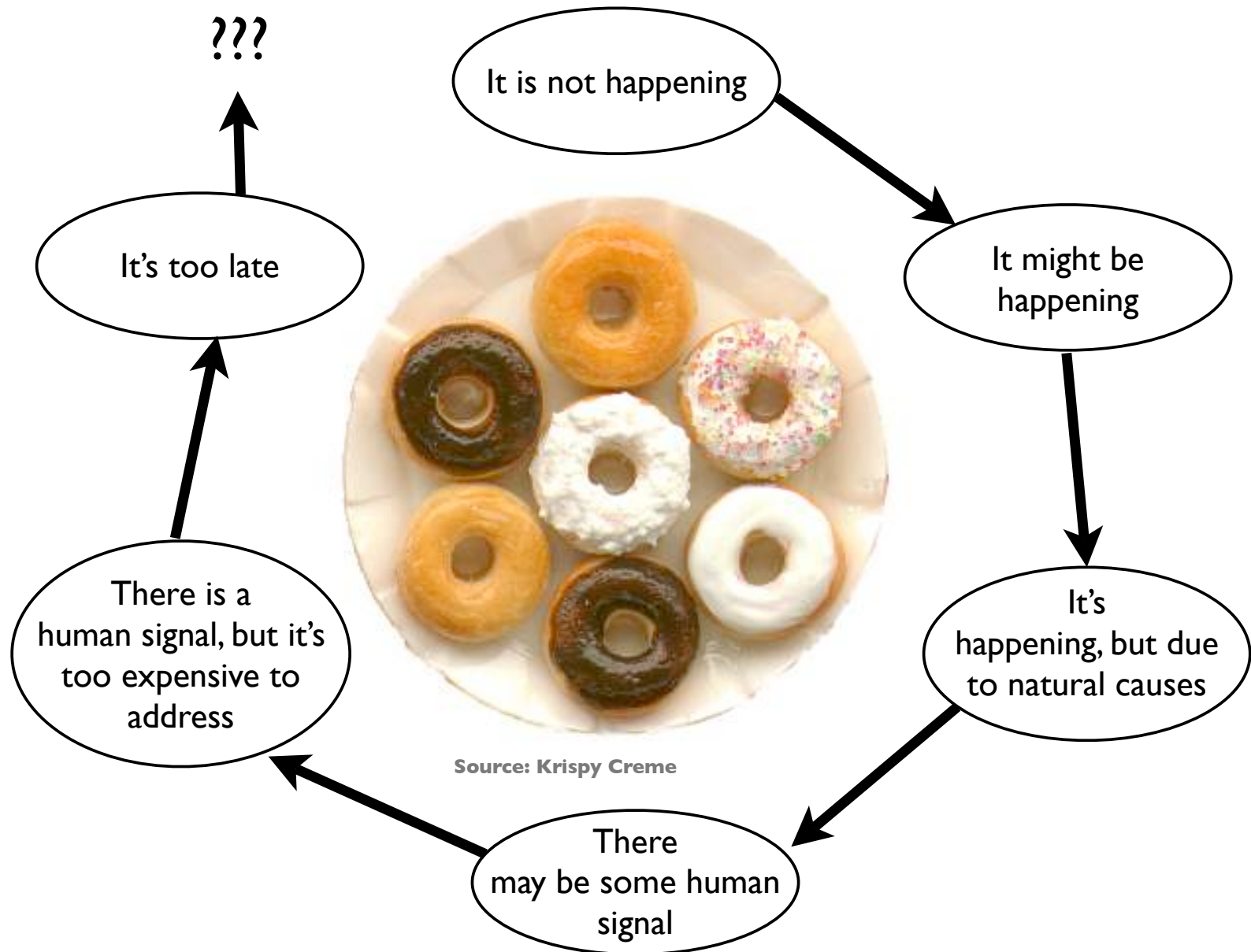
Suffer

World Health Organization (WHO) estimates 150,000 yearly deaths from climate change (as of 2000)



World Health Organization, *Climate Change and Human Health - Risks and Responses*, 2003.

The Slippery Slope of Climate Deniers



Propaganda

- Cherry-picking
- Avoidance of peer review
- Fraud
- Ideological trojan horse



SKEPTICISM

ABOUT SKEPTICS

Many conservatives regard the “scientific consensus” about global warming as a media concoction. After all, didn’t 17,100 skeptical scientists sign a petition circulated in 1998 by the Oregon Institute of Science and Medicine? (See www.oism.org/pproject and www.prwatch.org/improp/oism.html on the World Wide Web.) SCIENTIFIC AMERICAN took a random sample of 30 of the 1,400 signatories claiming to hold a Ph.D. in a climate-related science. Of the 26 we were able to identify in various databases, 11 said they still agreed with the petition—one was an active climate researcher, two others had relevant expertise, and eight signed based on an informal evaluation. Six said they would not sign the petition today, three did not remember any such petition, one had died, and five did not answer repeated messages. Crudely extrapolating, the petition supporters include a core of about 200 climate researchers—a respectable number, though rather a small fraction of the climatological community.

Scientific American’s review of infamous 1998 “Scientific Consensus” survey of deniers:

- 200 of 1,400-climate-related, PhD-bearing signatories of the 17,000-name petition were in fact climate researchers.
- About 1/3 of those still agreed with the petition (only one of which was an active climate researcher)
- 1/3 did not remember receiving the petition

Are Frogs Smarter than Humans?



“When the winds of change blow, some
build walls ... others build windmills.”

- *Chinese Proverb*



<http://eetd.lbl.gov/emills>

emills@lbl.gov

“When the winds of change blow, some
build walls ... others build windmills.”

- *Chinese Proverb*



<http://eetd.lbl.gov/emills>
emills@lbl.gov